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Florida Teletraining Project
Final Report

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13. ABSTRACT *(Maximum 200 words)*

The need for increased training has prompted the military services, industry and academia to research several different distance education strategies(i.e. courses of instruction packaged for delivery at remote locations), including video teletraining (VTT). Since RC personnel are only available for an equivalent of 48 training days a year, less expensive, more accessible training methods must be found for reclassifying RC personnel in their occupational specialties. The purpose of the research effort was to assess the feasibilty of using two year community colleges to offer military course to RC and active component personnel using a two way audio and video teletraining system. Five courses were reconfigured for delivery on teh US Army Teletaining Networ (TNET). Three US Army Reserve Component Configured Courses (RC) courses amd two US Navy special topics courses were presented during a four month period in late 1992 and early 1993. The courses were evaluated on the basis of student performance on standard military proficiency tests and 40 other data gathering instrucments. The research demonstrated that VTT is a reliable and effective means for delivering training to military personnel. The VTT approach appears to be acceptable to both students and instructors. Community colleges effectively developed and delivered occupational training to the military.

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FORWORD

The FY 1991 Defense Appropriation Bill, directed DoD to develop a pilot program to evaluate the use of two year colleges and teletraining to deliver military programs of instruction to members of the armed services in Florida. The program was initiated by Dr. Steven Skiles of the Defense Training and Performance Data Center (TPDC), and completed under the direction of Mr. Bill West, after the program was transferred to the control of the Defense Institute for Training Resources Analysis (DITRA). The research was conducted by the Institute for Simulation and Training of the University of Central Florida.

The final report of this research project documents the training performance achieved and costs demonstrated on the three Army and two Navy courses chosen for presentation in the program. As with any relatively small research effort, caution must be exercised in making inferences beyond the population of specific courses taught and students participating in the study. This is especially true with respect to the costs demonstrated for the particular courses chosen. The costs presented within the report are *an accurate representation* of what was expended in the preparation and presentation of these classes on a one time basis. **A relative cost comparison on the expected life cycle costs of video teletraining and "standard" forms of military instruction was not accomplished,** nor originally intended to be part of this research effort.

This research provides important information needed by the DoD in its ongoing investigations on providing the most effective and cost efficient methods of maintaining the training readiness of the Total Force of the DoD. It has also identified again, the need for high quality measures of training effectiveness to use in comparing alternative methods of training presentation. Without these measures, cost and effectiveness comparisons will continue to be done on a subjective bases.

Howard H. McCann
Executive Director

ACKNOWLEDGEMENTS

This report was made possible through government contract No. N61339-85-D-0024, Delivery Order 10 awarded by the Defense Training and Performance Data Center (TPDC) and the Defense Institute for Training Resources Analysis (DITRA) to the Institute for Simulation and Training (IST) at the University of Central Florida (UCF). Overall project direction was provided by Dr. Stephen C. Skiles and Mr. Bill West. The IST project direction was provided by Dr. William J. Bramble and Dr. Barbara L. Martin. This report was produced by IST, with assistance from the Florida Community College at Jacksonville (FCCJ).

Special thanks are due to Ms. Marlene Camper, Project Director at FCCJ, Mr. Doug Kerley, Instructional Manager at FCCJ, and Ms. Kathy Clower, Media Production Manager at FCCJ for their input into this report. Their insights and assistance contributed to the conclusions contained within.

Thanks are also due to Ms. Shannon Duffy and Mr. Eric Llewellyn, Student Assistants, and Ms. Mary Lou Grover, Project Secretary at IST, for their patience and expertise in editing the report and producing the tables, figures, and final version of this report.

EXECUTIVE SUMMARY

Introduction

The Department of Defense (DoD) was directed by Congress in the FY 1991 Department of Defense Appropriations Bill to conduct a pilot program to test the feasibility of using a telecommunications training network to deliver military programs of instruction to the armed services in Florida. The DoD determined that this program would employ a video teletraining (VTT) network to deliver instruction that addressed specific military duties and would be presented to the Active Components (AC) and Reserve Components (RC) of the services.

This program was to be conducted by two-year community colleges in collaboration with armed forces schools. Local colleges and military units are a natural partnership because of the need for military units to retrain, for military personnel to earn college credit, and because of the reservists' limited training availability (reservists are only available for the equivalent of thirty-eight calendar days a year (Watt, 1988)). Watt stated that the reserve forces are an underserved educational population and that local educational institutions can meet many of the reservists' needs. Evidence exists that such partnerships can work and that they can provide many benefits to both the college and the reserve unit. The Florida Teletraining Project (FTP) was designed in part to test the capability of the community colleges to provide VTT instruction to reservists.

Objectives

The FTP was directed to identify, collect, and evaluate telecommunications and pilot project test data. The specific project objectives were to:

- ascertain the merit of using telecommunications training provided by non-military sources (i.e., community colleges) for training military personnel
- quantify the value of the instruction received
- guide future government and DoD decisions related to distance learning.

Twenty-one evaluation objectives were identified for the project in the following categories: technology, instruction, community colleges, and cost. Data related to each of the objectives was collected from: (a) students, (b) course developers who were also the VTT instructors, (c) all remote site personnel including Instructional Coordinators (ICs), Points of Contact (POCs), and technicians, (d) administrative project staff at the origination site, (e) technical and production teams, and (f) military personnel including subject matter experts (SMEs), on-camera military instructors, and military remote site personnel.

These evaluation objectives focused on the:

- technology selected for the project (e.g., ascertaining its reliability, the target community's acceptance of it, and how appropriate it was for providing the training)

- instruction (e.g., determining whether or not the students met the learning objectives, and the effectiveness of the instructional strategies)

- community college (e.g., roles and responsibilities as providers of military) instruction

- costs (e.g., developing a cost model, determining the cost of course design and implementation, estimating the cost of an operational system, and comparing the cost of a telecommunications approach to the cost of selected conventional training options).

Thus, the purpose of the FTP was to assess the feasibility of using two-year community colleges to offer military courses to military personnel using a telecommunications network. Initially, the Training and Performance Data Center (TPDC) was the coordinating government agency for the project. However, when TPDC was deactivated approximately one-third of the way through the project, the Defense Institute for Training Resources Analysis (DITRA) in Monterey, California, coordinated the remainder of the project. The Institute for Simulation and Training (IST) in Orlando, Florida, was the prime contractor, and the Florida Community College at Jacksonville (FCCJ) was the primary subcontractor.

A number of military and civilian organizations participated in the FTP. In the primary roles of design, development, and implementation of the instruction were the community colleges and U.S. Army Reserve Forces (USARF) schools, three Army proponent schools, and two Chief, Naval Education and Training (CNET) schools.

Course Reconfiguration

Five courses were reconfigured for delivery on the U.S. Army Teletraining Network (TNET). Three U.S. Army Reserve Component Configured Courseware (RC^3) Military Occupational Specialty (MOS) courses were conducted: 71L10, Administrative Specialist; 76Y10, Unit Supply Specialist; and 95B10, Basic Military Police. These courses were delivered once each to Army National Guard and Army Reserve soldiers who were seeking to be reclassified in these MOSs. Two Navy special topics courses were conducted: Handling Hazardous Waste--Activity Level (HazWaste) and Total Quality Leadership (TQL). The latter courses addressed joint services needs and were made available to members of interested services and components. HazWaste and TQL were offered three and two times respectively.

The courses were delivered to three Florida community college remote sites: St. Petersburg Junior College (SPJC), Valencia Community College (VCC) in Orlando, and at FCCJ.

HazWaste and TQL were also offered at two out-of-state sites during the final administrations of these courses: Ft Taylor Hardin in Montgomery, Alabama and Camp Fogarty in East Greenwich, Rhode Island.

The five courses selected for VTT delivery had to be converted from the standard mode of platform delivery to VTT delivery. The five-component Systems Approach to Training (SAT) model was adapted for use in reconfiguring the courseware. In the adapted model, the five functions of the SAT were included (i.e., Analysis, Design, Development, Implementation, and Evaluation); due to the complexity of the reconfiguration effort, two functions were added (Revise Instruction and Management). The adapted model is based on learning and instructional theory.

The five courses that were reconfigured in the FTP were assigned by the government. Therefore, the traditional tasks performed during the analysis phase of the SAT model were not conducted during this project. However, these courses were analyzed for their suitability for VTT. During the design phase, the Programs of Instruction (POIs) and syllabi were analyzed to determine the adequacy of the course materials from an instructional design perspective. In the Development Phase, the instruction was developed and produced. All course materials were developed during this phase of reconfiguration. Preparation for, and the delivery of, instruction were the primary goals of the implementation phase of the reconfiguration process. The Revise Instruction Phase was added to the adapted model because several revision and validation cycles had to be performed during the reconfiguration process. The Management Phase was also added to the adapted SAT model because of the complexity of the project. Three primary groups of people, with a web of complex relationships among them, had to coordinate for the success of the project. These groups included: (a) the design, development, production, implementation, and evaluation teams, (b) the military organizations and groups involved in the project, and (c) the three community colleges. The project director at IST and the project manager at DITRA were responsible for these tasks.

A considerable amount of data was collected during delivery of the courses (Evaluation Phase). One of the roles of project personnel was to collect data from students, and data were collected from all project personnel. The results of these evaluation activities are the primary focus of this report.

Course Delivery

Instruction was presented *live* over TNET. At the origination site, the primary person responsible for content presentation was the VTT Instructor. The content of the courses, however, required that a military instructor/SME, the Military Instructional Assistant (MIA), deliver some of the content. During delivery, up to three people were needed to implement the instruction.

At each remote site, a community college site coordinator, known as the Instructional Coordinator (IC), was needed as the instructor of record for each course. The IC also performed some of the off-line instructional roles. For the MOS courses, a Military Site Coordinator (MSC)

was also required. The IC and MSC were the VTT Instructors' representatives at the remote sites. It was their responsibility to manage the instructional activities at each remote site.

Background

Distance Education and Video Teletraining

The need for increased training has prompted the military services, industry, and academia to research several different distance education strategies, including audio teleconferencing, computer-based teleconferencing, and VTT. While the research is in its infancy and many of the studies have limitations, researchers have drawn two primary conclusions: (a) students typically do as well on learning outcomes using distance education methods as they do when taught by conventional methods, and (b) student satisfaction using distance education is equal to or higher than classroom instruction (DeLoughry, 1988; Fahl, 1983; Grimes, Neilsen, & Niss, 1988; Keene & Cary, 1990; Kruh, 1983; Partin & Atkins, 1984). The need to find cost effective and efficient learning strategies has led to conclusions about what technologies are viable and effective, what courses should be selected for distance education, and what variables are key when designing distance learning courses.

Communication technologies now exist to present instruction via distance learning. VTT, also known as interactive television, is an application of distance education presented by a two-way audio and two-way video system. Using a myriad of media--print, audio, video, computers, supplemental technologies (e.g., the telephone and facsimile machine), and off-line equipment (e.g., video players)--provides instructors and students with a means for communicating and learning that may be almost as good as being there.

The major advantage of VTT is that it offers live instruction. While other technologies may be both viable and cost effective, the option of live instruction available through VTT may outweigh other distance learning strategies. However, the choice of technologies may also be partly dependent on the types of courses selected for distance education. Both the Navy and the Army have used VTT to provide faster, more efficient, and more cost effective training.

TRADOC (1987) supports the use of VTT and maintains that it is both an effective and cost efficient method for presenting instruction to RC forces. The Naval Air Warfare Center, Training Systems Division (NAWCTSD), formerly the Naval Training Systems Center (NTSC), has also conducted a series of studies that addressed different aspects of VTT. They too concluded that VTT was a viable alternative for providing high quality and cost effective instruction to distance learners.

General VTT Recommendations

The NAWCTSD developed a course selection model for Navy VTT. The major recommendations from this study were: (a) select courses that have a high potential for savings, e.g., courses with high throughput and short duration, (b) select courses that have an appropriate

mix of lecture and laboratory, (c) do not select courses that are equipment intensive, and (d) do not select courses that require substantial curriculum modification.

Studies conducted by the Army and the Navy have concluded that distance education courses typically require more extensive planning than platform instruction. Haarland and Newby (1984) state that the increases in student performance and satisfaction may be due to improved course design and teaching performance rather than as a function of a specific technology. TRADOC endorses the SAT model for the design of courses and states that effective course delivery must take into account proper management of the design, resourcing, development, production, distribution, and evaluation of VTT programs.

At the core of interactive television is the concept of interactivity (Moore, 1989; Ritchie & Newby, 1989; Stoffel, 1987). Interactive television is defined by the fact that good instruction, whether it is presented in a classroom or at a distance, stresses interaction among the participants in the teaching-learning process.

In addition to interactivity, the following course design features are also necessary for successful VTT:

- group dynamics should be addressed
- student involvement activities need to be carefully structured
- lecture segments should not exceed 20 minutes
- visual aids must be adapted for television viewing
- careful planning is required to handle student questions and discussions
- instructors must involve and motivate learners
- an interactive study guide (ISG) must be provided

Because military projects are often large, management issues when using VTT are of utmost importance. Maloy and Perry (1991) addressed the policy and management issues of a large Navy project. They found that a large teletraining project required a team approach. Some of the key team members were an educational specialist (e.g., an instructional designer or evaluation expert), an engineer, a budget analyst, an audio-visual specialist, a security specialist, a researcher/analyst, a resource sponsor specialist (to provide support at the highest level), and representatives from civilian personnel, fleets, training command, and reserves.

In summary, effective teletraining courses are similar to other effective distance education programs. Among other things, they must be well-designed, provide opportunities for interaction and involvement, make good use of visuals, and be media-based.

Evaluation Methodology

Students

DITRA coordinated the selection of the students for this project. Students were selected by their respective military commands; for example, the 81st Army Reserve Command (ARCOM) and the Florida Army National Guard (FLARNG). A total of 275 students were trained during the project. All four services (including the reserve components of the Army and the Air Force), and the U.S. Coast Guard were involved: FLARNG, Florida Air National Guard, U.S. Army Reserve, U.S. Navy (military and civilian personnel), U.S. Marine Corps, U.S. Coast Guard, Rhode Island Air National Guard, and Alabama Army National Guard.

The average age of all the students was 33.37 years. A grade of E5 was selected as an approximate estimate of the numbers of students who were managers versus those who were first line supervisors and enlisted personnel. Approximately 63 percent of the students were E5s or below. In addition, approximately 30 percent of the students had a duty position related to the course in which they were enrolled and 4.9% had a civilian occupation related to the course content. All of the students were high school graduates or the equivalent and 15% had a four-year college degree or more.

Students were asked how interested they were in the course content prior to taking the course. Approximately 73 percent rated themselves as very interested (5 on a 5-point scale). When asked if they had ever taken a course taught by television, approximately 19 percent reported that they had.

Evaluation Instruments

There were 40 different data gathering instruments developed by FTP personnel in conjunction with Systems for Training and Applied Research, Inc., Lexington, Kentucky. In addition, six standard Army forms were used to collect the test data. Performance test (PT) measures were used in evaluations where possible.

Procedures

A complete set of evaluation forms for each participant (students and remote site personnel) in each of the MOS courses was compiled into a data collection notebook and distributed to each remote site on the first day of each course. (Notebooks were not needed for the special topics courses because all the data was collected during these one day courses). Directions were provided with the notebooks that specified what data was to be collected, when it was to be collected, and from whom.

All student and instructional personnel interviews were conducted by the project evaluators. Interviews were conducted and questionnaire data collected according to a predetermined schedule. Individual student interviews were conducted by the project evaluators immediately after the students completed the questionnaire(s).

The data were organized by categorizing each item on each evaluation form according to its related objective or objectives. The data were further organized by determining whether each item provided data that was course, site, or student related. Broad issues related to each objective were also identified. This resulted in a data matrix for each evaluation objective.

The evaluation and cost data were coded as necessary and entered into a database. The Windows version of the Statistical Package for Social Sciences (SPSS for Windows 5.0) was used to analyze the evaluation data.

Conclusions

As previously stated, the purpose of the FTP was to assess the feasibility of using two-year community colleges to offer military programs of instruction that addressed specific military duties and content. In general, the TNET system was reliable, the instruction was effective, and the community colleges were able to present high quality instruction. In this project VTT was more expensive to implement than resident training. The costs for conducting resident training were incomplete (e.g., base operating costs were not included). Therefore, the comparisons are skewed in favor of resident training.

Concerning technology, the TNET system was 99% reliable and possessed high quality. Students and ICs indicated that they preferred the VTT approach to traditional training. However, even with training, the instructional personnel felt that more training and practice was needed using the TNET system.

The most important objective was the quality of instruction. All students passed the learning objectives, and over 90% of all students in the MOS courses passed the PTs on the first attempt. Students rated the learning methods to be effective, and they showed interest in, and were motivated by the VTT instruction. Students also rated the instructional personnel as effective. A question that arose was whether or not civilians, with their lack of military training, can provide quality instruction to military students. The answer generally appears to be yes.

Student demographic variables did not predict success or lack of it for military students. Thus, it appears that VTT is an acceptable approach for the general military population. However, no empirical comparisons could be made between the performance records of students in the VTT courses and those in other training options.

The community colleges have the technical and instructional capabilities to implement VTT instruction. The technical staff, TV studio, and production facilities were excellent. While the faculty at FCCJ (the origination site) lacked instructional design and military training expertise, they were able to present high quality instruction given specific training.

The community colleges were also able to grant academic and continuing education credit (CEC) for all courses. Although not all students were interested in receiving credit, those that were indicated that college credit was a definite advantage to having military training provided at a community college.

In general, during this project, VTT was more expensive to conduct than resident training partly due to the expense of the technology. With the exception of the HazWaste course, the VTT courses were more expensive than resident training. The HazWaste course was less expensive because there were a large number of students in the course and because of travel and per diem savings. The VTT courses become more cost effective if the same course is presented more than once because design and development costs are paid only once. In addition, if different courses are presented in the same month, each course can share the TNET costs for that month. However, cost alone is not the only factor to consider when comparing VTT to other training options. If VTT provides students greater access to courses they might not otherwise receive, and if college credit is deemed a benefit of military training, then higher costs for VTT may be worth the additional expenditure.

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INTRODUCTION

Scope of Work

The Department of Defense (DoD) was directed by Congress in the FY 1991 Department of Defense Appropriations Bill to conduct a pilot program to test the feasibility of using a telecommunications training network to deliver military programs of instruction to the armed services in Florida. The bill stated that the pilot program could be developed and implemented by two-year colleges in collaboration with armed forces schools.

Having been tasked to carry out the project, the DoD determined that the pilot program would satisfy the congressional direction by using a teletraining network to deliver military programs of instruction: (a) to both the Active Components (AC) and Reserve Components (RC) of the services and (b) that addressed specific military duties. In addition, it was directed that the program should have a scientifically valid evaluation. The project was directed to identify, collect, and evaluate telecommunications and pilot project test data that could be used to:

(1) ascertain the merit of using telecommunications training provided by non-military sources (i.e., community colleges) for training military personnel,
(2) quantify the value of the instruction received, and
(3) guide future government and DoD decisions related to distance learning.

Purpose and Scope of the Florida Teletraining Project

The purpose of the Florida Teletraining Project (FTP) was to assess the feasibility of using two-year community colleges to offer military courses to military personnel using a telecommunications network. The instruction was delivered from the Florida Community College at Jacksonville (FCCJ) to three remote sites: Valencia Community College in Orlando (VCC), St. Petersburg Junior College (SPJC), and a remote classroom site at FCCJ. The Training Performance and Data Center (TPDC), in Orlando, and later, the Defense Institute for Training Resources Analysis (DITRA) in Monterey, California, was the coordinating government agency for the project. The Institute for Simulation and Training (IST) in Orlando was the prime contractor for the project.

Five courses were reconfigured for delivery on the U.S. Army Teletraining Network (TNET). Three U.S. Army Reserve Component Configured Courseware (RC^3) Military Occupational Specialty (MOS) courses were: 71L10, Administrative Specialist; 76Y10, Unit Supply Specialist; and 95B10, Basic Military Police. These courses were delivered once each to Army National Guard and Army Reserve soldiers who were seeking to be reclassified in these MOSs. Two U.S. Navy special topics courses were: Handling Hazardous Waste--Activity Level (HazWaste) and Total Quality Leadership (TQL). The latter courses addressed joint services needs and were made available to members of interested services and components, i.e., Army National Guard, U.S. Marines, Air National Guard, U.S. Navy, and U.S. Coast Guard. HazWaste and TQL were offered three and two times respectively.

Two out-of-state sites participated in the project during the final administration of the special topics courses: Camp Fogerty (FOG) in Rhode Island and Ft Taylor Hardin (FTH) in Alabama. Both HazWaste and TQL were presented in Rhode Island. Only HazWaste was presented in Alabama. In Rhode Island, the students who participated in the project were from four different branches of the military: Rhode Island Army National Guard, U.S. Marines, Rhode Island Air National Guard and the U.S. Navy. In Alabama, the students enrolled in the course were Alabama Army National Guard and U.S. Marines.

Purpose of this Report

The purpose of this report is to present the evaluation results of the FTP. A separate document, *Florida Teletraining Project: Reconfiguration of Military Courses for Video Teletraining Delivery* (Martin, 1993), describes the processes and personnel that were used to design, develop, and deliver the five video teletraining (VTT) courses. This report is available from DITRA.

Project Participants

A number of military and civilian organizations participated in the FTP. In the primary roles of design, development, and implementation of the instruction were the community colleges and U.S. Army Reserve Forces (USARF) schools, three Army proponent schools, and two Chief, Naval Education and Training (CNET) schools. These participants, plus other key organizations are listed in Table 1.

Some of the tasks accomplished by various military organizations were to:

- identify the students
- arrange for student participation
- select appropriate subject matter experts (SMEs) and military instructional assistants (MIAs)
- provide needed course and reference materials
- provide military content and doctrine review
- define and establish the approval processes for the reconfigured courses, and
- certify the students and the instruction.

The primary roles of the civilian organizations were:

- IST was the prime contractor and had overall responsibility for executing the project. IST also provided technical assistance for the project.

- FCCJ was responsible for the design, development, and implementation of the courseware, for providing one remote site and, for insuring that organizational decisions regarding the community colleges were made.
- VCC and SPJC each provided a remote site for receiving the instruction.

TABLE 1

PROJECT PARTICIPANTS
DOD
OASD (FM&P), DITRA
National Guard Bureau
U.S. Army Forces Command
U.S. Army Reserve Command
2nd Army
81st Army Reserve Command
Florida National Guard
U.S. Army Training and Doctrine Command
U.S. Army Training Support Center
U.S. Army Extension Training Directorate
U.S. Army Military Police School
U.S. Army Quartermaster School
U.S. Army Soldier Support Center
Chief, Naval Education and Training
Naval Training Systems Center
Commander, Naval Aviation Activities, Jacksonville
Orlando Naval Training Center
Naval Air Station, Cecil Field, Jacksonville
Headquarters, U.S. Air Force
Marine Corps Combat Development Center
CIVILIAN EDUCATION INSTITUTIONS
University of Central Florida, Institute for Simulation and Training
Florida Community College at Jacksonville
Valencia Community College
St. Petersburg Community College

General Project Objectives

The general project objectives were to:

- ascertain the merit of using telecommunications training provided by non-military personnel
- quantify the value of the instruction received
- provide generic lessons learned from pilot test
- provide input to guide further government and DoD decisions related to distance learning.

Twenty-one separate evaluation objectives were identified related to the general objectives including:

- Four objectives related to the *technology* selected for the project
- Six objectives related to the *instruction*
- Seven objectives related to *community college roles and responsibilities* as providers of military instruction
- Four objectives related to *costs*.

Project Management and Timeline

The Defense Training Performance and Data Center (TPDC) and DITRA administered the project. The timeline shown in Figure 1 gives the key events of the FTP. A kickoff conference hosted by TPDC and IST was held in Orlando in November 1991 for all project participants. In December, 1991 the course design and development process began. Design and development of some of the courses occurred simultaneously with course delivery. The Army MOS courses were presented from 5 October through 18 December 1992. The Navy courses were presented from 27 January through 25 February 1993. Data was collected from 3 August 1992 through October 1993. Project data was analyzed and the final report written from February 1993 to January 1994.

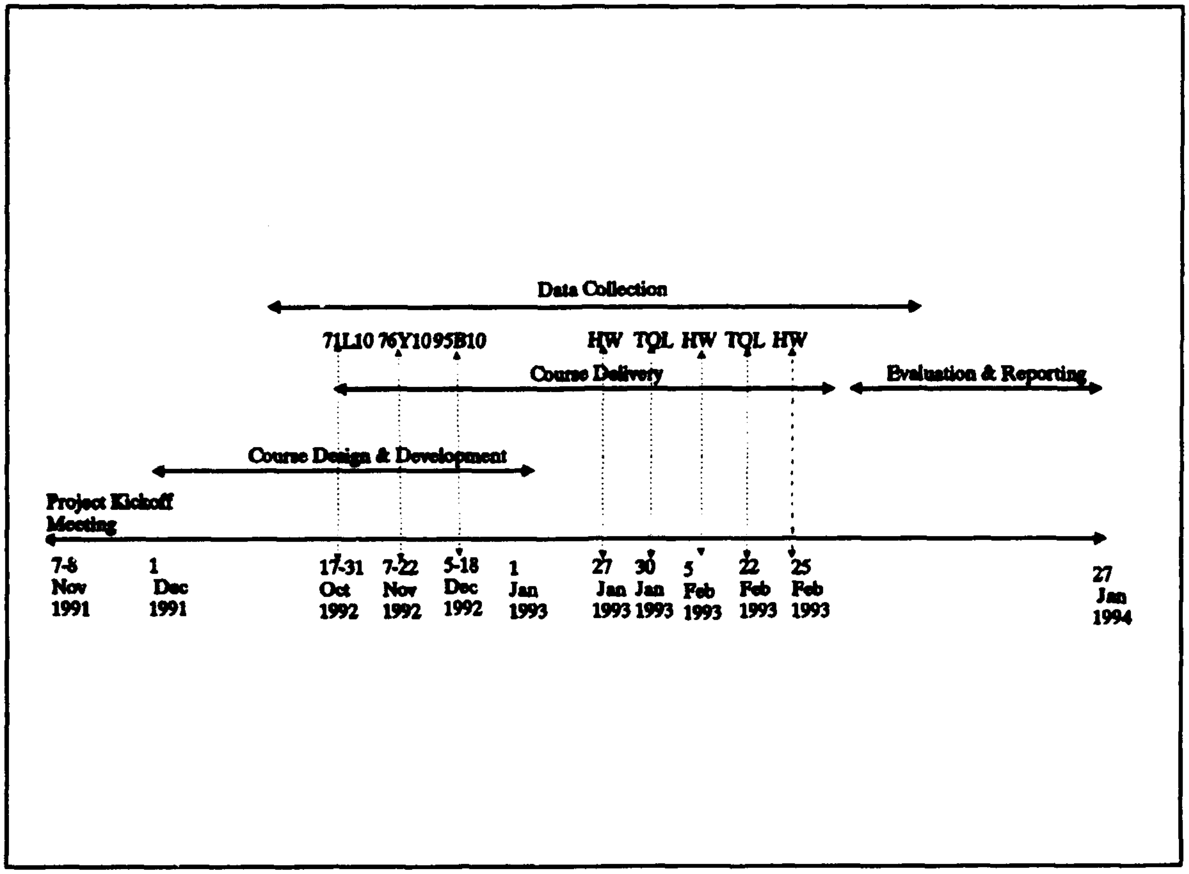


Figure 1. Project Timeline: Key Milestones

Organization of the Report

This report is organized into six major sections: (a) background and overview of the project, courses, and methodology, (b) results of the data related to the technology, (c) results of the data related to the instruction, (d) results of the data related to the community colleges, (e) results of the cost analysis, and (f) summary and conclusions.

BACKGROUND

Teletraining Research in the Military

Recent interest has been shown by the military in methods of distributed training, i.e., courses of instruction packaged for delivery at remote locations, including VTT. The Training and Doctrine Command (TRADOC) (1990) stated that the goals of a distributed training strategy were to "increase training opportunities, improve the quality of instruction, increase standardization, and reduce the time soldiers spend away from their units" (p. 2-16).

Two of the key reasons for reliance on a distributed training strategy are: (a) the importance and size of the RC and (b) dwindling resources. It is estimated that the RC constitutes more than half of the Army's combat arms units and more than two-thirds of the Army's combat support and combat service support units (TRADOC, 1990). These soldiers must be trained to AC standards yet they do not train on a daily basis. Training must be developed to meet both the Army's needs and the time frames available to train RC soldiers.

The need for increased training has prompted the military services, industry, and academia to research several different distance education strategies, including audio teleconferencing, computer-based teleconferencing, and video teleconferencing. While the research is in its infancy and many of the studies have limitations, researchers have drawn two primary conclusions: (a) students typically do as well on learning outcomes using distance education methods as they do when taught by conventional methods, and (b) student satisfaction using distance education is equal to or higher than classroom instruction (DeLoughry, 1988; Fahl, 1983; Grimes, Neilsen, & Niss, 1988; Keene & Cary, 1990; Kruh, 1983; Partin & Atkins, 1984).

The need to find cost effective and efficient learning strategies has led to conclusions about what technologies are viable and effective, what courses should be selected for VTT, and what variables are key when designing distance learning courses.

What Technologies are Viable and Cost-effective?

Communication technologies now exist to present instruction via distance learning. VTT, also known as two-way interactive television, is an application of distance education presented by a two-way audio and two-way video system. Using a myriad of media--print, audio, video, computers, supplemental technologies (e.g., the telephone and facsimile machine), and off-line equipment (e.g., video players)--provides instructors and students with a means for communicating and learning that may be almost as good as being there.

Both the Navy and the Army have used VTT to provide faster, more efficient, and more cost effective training. TRADOC (1987) supports the use of VTT and maintains that it is both an effective and cost efficient method for presenting instruction to RC forces. The Naval Air Warfare Center, Training Systems Division (NAWCTSD), formerly the Naval Training Systems Center (NTSC) has also conducted a series of studies that addressed different aspects of VTT (Bailey, Sheppe, Hodak, Kruger & Smith, 1989; McDonald, Weisenford, Fleeton, Kreiner & Hodak, 1990; Sheppard, Gonos, Weisenford & Hodak, 1990). They too concluded that VTT was a viable alternative for providing high quality and cost effective instruction to distance learners.

The Army has two VTT systems, the TRADOC Satellite Education Program at the U.S. Army Logistics Management Center (ALMC) at Ft Lee, Virginia and the TNET system operated by the Army Extension Training Directorate (AETD) at Ft Eustis, Virginia. The systems are different in that the former uses one-way, full motion analog video and the latter uses two-way, compressed digitized video. *Training Strategies for the 90's* (TRADOC, 1991) summarized the studies that have been done on the two systems and stated that both are cost and learning effective. The report stated, "VTT appears to be the solution to a myriad of problems involved in sustaining a well-trained force."

The U.S. Navy CNET Electronic Schoolhouse Network (CESN) at the Fleet Combat Training Center, Atlantic (FCTCLANT) located in Dam Neck, Virginia, also uses compressed digitized video, however, it is only one of the VTT configurations the Navy has experimented with (Maloy & Perry, 1991). CESN interconnects major fleet training facilities (e.g., schoolhouses) rather than distributing training over a widely dispersed network.

In addition to VTT, the military services have developed and used computer-based technologies for distance education. SMART, System for Managing Asynchronous Remote Training, was one of the successful systems developed to provide computer-mediated instruction to reservists (Harbour, Daveline, Wells, Schurman, & Hahn, 1990). The advantage of VTT is that it offers *live* instruction. While other technologies may be both viable and cost effective, the option of live instruction available through VTT may outweigh other distance learning strategies. However, the choice of technologies may also be partly dependent on the types of course selected for distance education.

What Courses Should be Selected for Video Teletraining?

McDonald, et al. (1990) developed a course selection model for Navy VTT . The major recommendations from this study were: (a) select courses that have a high potential for savings, e.g., courses with high throughput and short duration, (b) select courses that have an appropriate mix of lecture and laboratory, (c) do not select courses that are equipment intensive, and (d) do not select courses that require substantial curriculum modification.

One reason the Navy's CESN two-way audio and video teletraining network in Dam Neck, Virginia has been found to be both cost effective and efficient is because of appropriate course selection (CNET Handout, 1992). System utilization increased from 46% in 1989 to 90% in 1992. The factors that raised the utilization rate were delivery of teletraining courses that:

- were single sited (delivered by one single schoolhouse and only presented via CESN)
- had high demand (throughput)
- averaged about one week in length
- were designed to address cognitive rather than psychomotor skills.

What are the Key Design Variables for Distance Learning and Video Teletraining Courses?

Studies conducted by the Army and the Navy conclude that distance education courses typically require more extensive planning than platform instruction. Haarland and Newby (1984) stated that the increases in student performance and satisfaction found in the research may be due to improved course design and teaching performance rather than as a function of a specific technology. TRADOC endorses the systems approach to training (SAT) for the design of courses and states that effective course delivery must take into account proper management of the design, resourcing, development, production, distribution, and evaluation of VTT programs.

In a comprehensive review of the literature on computer-mediated communications (CMC), Wells (1990) discussed the factors relevant for an instructor and course designer in a distance learning environment. She stated that: (a) students and instructors must be provided with an orientation to CMC in order for a program to be effective, (b) instructors must play a motivational and facilitative role, including maintaining personal contact with students, (c) students must be provided with consistent and regular feedback, and (d) interaction with other students typically has a positive effect on completion rates and performance. In addition, she lists other important factors for successful distance education: (e) topics that lend themselves to discussion rather than rote memorization are best, (f) the first unit of a course should not be too long or more difficult than later units, (g) using a variety of media is important, (h) completion rates are generally higher when the instructor rather than the student sets the schedule and pace, and (i) a successful CMC class is not dependent upon any face-to-face meetings.

At the core of VTT is the concept of interactivity. Good instruction, whether it is presented in a classroom or at a distance, stresses interaction among the participants in the teaching-learning process. Moore (1989) stated that there are three primary types of interaction: student to teacher, teacher to student, and student to student. Each type should be planned for during instruction. Stoffel (1987) also stated that student interaction with the instructional materials leads to positive outcomes in satisfaction and achievement. Some investigations have shown that in classrooms with higher levels of interaction, students have higher levels of achievement and more positive attitudes (Ritchie & Newby, 1989).

In addition to interactivity, the following course design features are also necessary for successful VTT (Bailey, et al., 1989; Cyrs and Smith, 1990; Defense Language Institute, 1992; McDonald, et al., 1990; Ostendorf, 1991; Sheppard, et al., 1990;):

- group dynamics should be addressed
- student involvement activities need to be carefully structured
- lecture segments should not exceed 20 minutes
- visual aids must be adapted for television viewing
- careful planning is required to handle student questions and discussions

- instructors must involve and motivate learners and

- an interactive study guide (ISG) must be provided.

Because military projects are often large, management issues are of utmost importance when using VTT. Maloy and Perry (1991) addressed the policy and management issues of a large Navy project. They found that a large teletraining project required a team approach. Some of the key team members were an educational specialist (e.g., an instructional designer or evaluation expert), an engineer, a budget analyst, an audio-visual specialist, a security specialist, a researcher/analyst, a resource sponsor specialist (to provide support at the highest level), and representatives from civilian personnel, fleets, training commands, and reserves.

In summary, effective teletraining courses are similar to other effective distance education programs. Among other things, they must be well-designed, provide opportunities for interaction and involvement, make good use of visuals, and be media based. A comprehensive discussion of course design issues related to VTT can be found in the *Reconfiguration* document available from DITRA.

Summary of General Issues in Video Teletraining

- Select courses that are cognitive rather than psychomotor and that have high demand.

- Course design and development is a critical component of a successful VTT course. Typically VTT courses require more detailed pre-planning than traditional courses. Time and resources must be allocated to the pre-planning stages.

- Courses must be designed to facilitate interaction, to provide feedback, to be motivating, and to humanize the instruction. Course developers must be knowledgeable in the principles of learning and instruction.

- Instructional personnel are one of the most important aspects of a VTT course. They may require considerable training and practice to be effective.

- It takes a team of people to design and deliver good VTT instruction. This team must be organized and the roles and responsibilities of all personnel must be delineated.

- Equipment failures occur. Contingency plans must be prepared. These plans may require the expenditure of additional time and resources.

- In large scale projects, all the various management and organization functions need to be coordinated. Someone who is knowledgeable in all aspects of VTT needs to maintain a big picture perspective.

OVERVIEW OF THE FLORIDA TELETRAINING PROJECT COMPONENTS

Description of the Courses

The **71L10 Unit Administrative Specialist** course is a single-phase course that can be taught in either an Inactive Duty Training (IDT) Phase or an Active Duty for Training (ADT) Phase (U.S. Army Soldier Support Center, 1991). This course was presented in an ADT mode. It was a 73-hour course and was presented during a two-week block from 17 October to 31 October 1992. The Administrative Specialist is responsible for the routine office administration of an activity. He or she works at various organizational levels throughout the Army, from company through division, installation, or higher headquarters.

The **76Y10 Unit Supply Specialist** course is a dual-phased (IDT and ADT) course (U.S. Army Quartermaster Center and School, 1989). Only the IDT phase was presented during the project. This phase of the course was 96-hours and was presented during a two-week block from 7 November to 22 November 1992. To receive the MOS, the 76Y10 student must also take the ADT phase. Arrangements for completing the ADT phase were made independently of this project. The Unit Supply Specialist performs unit and organization supply procedures. These include the tasks of request; receipt; storage; and issue and accountability of expendable and durable supplies and equipment (e.g., individual, organizational, installation).

The **95B10 Basic Military Police** course is also a dual-phase (IDT and ADT) course (U.S. Army Military Police School, 1991). Only the IDT phase was taught during this project. This phase of the course was 66-hours and was presented during a two-week block from 5 December to 18 December 1992. The ADT phase was presented by the 3391st USARF School at Camp Blanding, Florida in the summer of 1993. The 95B10 Military Police (MPs) are soldiers who perform the duties of entry level military police. The entry level MP performs the tasks of apprehension and search, patrol and traffic operations, investigations, physical security, and self-defense. In addition, the MP prepares and gathers military police information, reports, and forms.

Handling Hazardous Waste--Activity Level is a U.S. Navy course specially adapted for the FTP from the Hazardous Waste Coordinator course. The FTP one-day course was designed to give hazardous waste handlers the information necessary to make environmentally and personally safe decisions regarding the disposal of hazardous and regulated wastes. This course was offered a total of three different times, twice to the FTP teletraining remote sites on 27 January 1993 and 5 February 1993, and one additional time on 25 February 1993 to the three FTP sites, Camp Fogerty and Ft Taylor Hardin. The HazWaste course topics included a review of pertinent laws and regulations and a discussion of the physical and chemical properties of hazardous materials, the correct techniques for delivering and transferring hazardous materials at the hazardous waste collection site, and pollution and spill prevention.

Total Quality Leadership (TQL) is the U.S. Navy's adaptation of Dr. W. Edwards Deming's approach to continuous quality improvement (Mr. Jim Miller, Total Quality Leadership Curriculum Developer, CNET, personal communication, June 2, 1993). A one-day course was presented to provide an introduction to and an awareness of the U.S. Navy's TQL philosophy. This course was offered twice, once to the FTP sites on 30 January 1993, and once on 22 February 1993 to the three FTP sites and to Camp Fogerty. The topics covered during the course

included the background of TQL, how it is defined by the Navy, basic principles, methods and tools used in TQL, and how the Navy has implemented it.

Participating Sites

The five sites participating in the FTP are shown in Figure 2.

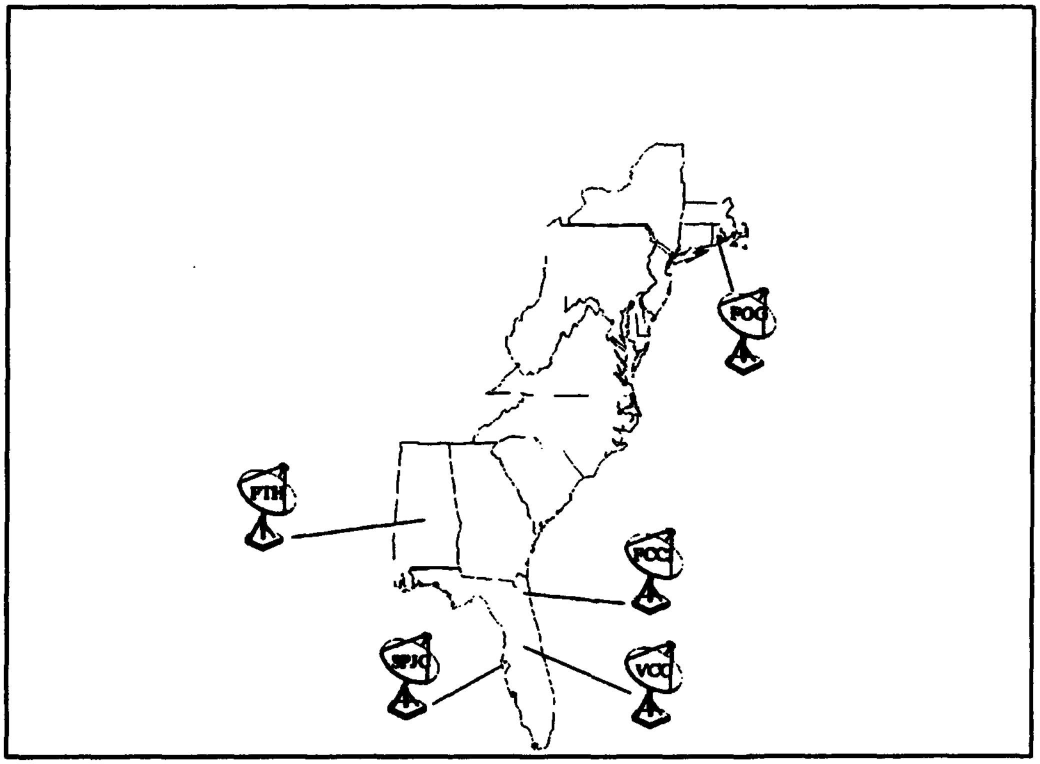


Figure 2. Florida Teletraining Project Origination and Remote Sites

FCCJ1 was the origination site for all five courses and the courses were presented at the following sites:

	FCCJ1	FCCJ2	SPJC	VCC	FOG	FTH
71L10	√	√	√	√		
76Y10	√	√	√	√		
95B10	√	√	√	√		
HAZ	√	√	√	√	√	√
TQL	√	√	√	√	√	

Both FCCJ1 and FCCJ2 were located in the Downtown Campus of the Florida Community College at Jacksonville. The Downtown Campus has a television studio that served as the origination site for the project. The remote site, FCCJ2, was located in an upstairs classroom in the same building as the origination site. Students at the remote site did not know that the instruction was being broadcast from the same building. This classroom was adapted for use as a pilot test site and official visitation center for the project.

The remote site at SPJC was located at the Allstate Center which houses the college's Criminal Justice Institute. The VCC remote site was located at the McCoy Center for Business and Industry Services which is adjacent to the Orlando Naval Training Center Annex. The remote site at Ft Taylor Hardin (FTH) was located in an Alabama Army National Guard Armory in Montgomery. The remote site in Rhode Island was located at Camp Fogerty National Guard Training Site (FOG). There were no trained technicians at the out of state sites.

EVALUATION METHODOLOGY

Student Population

DITRA coordinated the selection of students for this research. Students were selected by their respective military commands, for example, the 81st Army Reserve Command (ARCOM) and the Florida Army National Guard. Table 2 shows the number of students, by military service and course, who were enrolled at each site for the following courses: (a) MOS, (b) HazWaste, and (c) TQL. A total of 275 students were trained during the project. All four services (including the reserve components of the Army and the Air Force) and the U.S. Coast Guard were involved: Florida Army National Guard, Florida Air National Guard, U.S. Army Reserve, U.S. Navy (military and civilian personnel), U.S. Marine Corps, U.S. Coast Guard, Rhode Island Air National Guard, and Alabama Army National Guard.

Table 3 gives a composite of the students by course and selected demographic characteristics. The average age of all the students was 33.37 years. As an approximate estimate of the numbers of students who were managers versus those who were first line supervisors and enlisted personnel, a grade of E5 was selected; 63.18% of the students were E5s or below. Approximately thirty percent of the students had a duty position related to the course in which they were enrolled and 4.9% had a civilian occupation related to the course content. All of the students were high school graduates or the equivalent; 15% had a four-year college degree or more. Students were asked how interested they were in the course content prior to taking the course. Approximately seventy-three percent rated themselves as *very interested* (5 on a 5-point scale). When asked if they had ever taken a course taught by television, 18.86% reported that they had.

Evaluation Instruments

There were 40 different data gathering instruments developed by FTP personnel in conjunction with Systems for Training and Applied Research, Inc., Lexington, Kentucky. In addition, six Army forms were used to collect the test data. Appendix A lists each form, the data source (e.g., student, VTT instructor), the data collection schedule, and the course(s) for which the data were collected. While there are 32 forms listed that were developed by FTP personnel, there were different versions of Forms C1 and C2 (the pretest and posttests) for each of the five courses. Forms R and S were developed, but these data were never collected due to a DITRA directive. A brief description of the instruments is provided in Appendix B.

Table 2

Enrollment in Army MOS Courses
By Component and Site

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Florida Army National Guard	15	15	9	39
United States Army Reserve	20	19	21	60
Total	35	34	30	99

Enrollment in Hazardous Waste
By Service, Component, Site

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
United States Navy (Military)	18	2	0	1	0	21
United States Navy (Civilian)	0	16	0	0	0	16
United States Coast Guard	0	0	8	0	0	8
United State Marine Corps	0	6	2	2	0	10
Florida Army National Guard	14	8	14	0	0	36
Alabama Army National Guard	0	0	0	0	13	13
Rhode Island Army National Guard	0	0	0	12	0	12
Total	32	32	24	15	13	116

Enrollment in Total Quality Leadership
By Service, Component, Site

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
United States Navy	2	3	0	1	6
United States Marine Corps	0	3	0	9	12
Florida Army National Guard	18	10	9	0	37
Florida Air National Guard	2	2	0	0	4
Rhode Island Air National Guard	0	0	0	1	1
Total	22	18	9	11	60

Table 3

Characteristics of Students by Course

[illegible]	[illegible]	[illegible]	[illegible]	HAZ	TOL	[illegible]
Number of students in course	33	40	26	116	60	**275**
Average age	30.96	32.25	28.5	35.5	39.64	**33.37**
Highest grade (E5 or below)	91.2%	62.5%	92.3%	34.2%	35.7%	**63.18%**
Duty position related to course content	51.4%	37.5%	30.8%	12.3%	18.6%	**30.12%**
Civilian occupation related to course content	14.3%	2.5%	7.7%	NA	NA	**4.9**
Civilian education 4 year college degree or more	11.5%	10.0%	0%	6.1%	47.4%	**15%**
Interest in content (5 point scale - Very Interested	85.7%	77.5%	80.8%	59.6%	62.7%	**73.26%**
Course taught by TV (% yes)	17.1%	12.5%	19.2%	16.7%	28.8%	**18.86%**

Items from the instruments are included as necessary when the results are reported. Typical items include the following:

- Dichotomous data, usually "yes/no" responses or "like/did not like," for example,

  If you had the opportunity to take additional military teletraining instruction in the future, would you want to? ______*yes* ______*no*

- Ratings on a 3- or 5-point Likert scale, where the highest number is always the most positive response, for example,

  Please rate the aspects of this course on a scale from 1 to 5 or mark NA if the item is not applicable to this course:

  5 = Excellent
  4 = Very Good
  3 = Good
  2 = Below Average
  1 = Poor
  NA = Not Applicable

1.	*The VTT instructor's poise, personality and enthusiasm.*	*1*	*2*	*3*	*4*	*5*	*NA*
2.	*The VTT instructor's delivery of information over the network.*	*1*	*2*	*3*	*4*	*5*	*NA*

- Ranking a series of responses (coded so the highest number was always the most positive), for example,

  If you could pick from the following military training options in the future, which would you prefer as a method to receive training?

  _____ *Traditional classroom instruction at a military school*
  _____ *Video teletraining at a community college site*
  _____ *Correspondence study*
  _____ *Training provided locally by an assigned military instructor*
  _____ *Video teletraining received at your armory/reserve center*

- Open-ended questions, for example,

  If you could have changed something in the course, what would it be?

Procedures

A complete set of evaluation forms for each participant (students and remote site personnel) in each of the MOS courses were compiled into a data collection notebook and distributed to each remote site on the first day of each course. (Notebooks were not needed for the special topics courses because all the data were collected during these one day courses). Directions that specified what data were to be collected, when it was to be collected, and from whom, were provided with the notebooks.

All student and instructional personnel interviews were conducted by the project evaluators. Interviews were conducted and questionnaire data collected according to the schedule listed in Appendix A. Specific times were set aside at the beginning and end of each course for data collection and these times were specified on the training schedule for each course. Individual student interviews were conducted by the project evaluators immediately after the students completed the questionnaire(s). (Due to unforeseen circumstances, Camp Fogerty was closed for the day before the TQL course was completed; this resulted in no student data being collected at that site for that course).

The data were organized by categorizing each item on each evaluation form according to its related objective or objectives. The data were further organized by determining whether each item provided data that was course, site, or student related. Broad issues related to each objective were also identified. This resulted in a data matrix for each evaluation objective.

Data Analysis

The data were coded as necessary and entered into a database. The Windows version of the Statistical Package for Social Sciences (SPSS for Windows 5.0) was used to analyze the data.

Cost Analysis

An analysis of the cost and a discussion of the results is included in a separate section of this report.

OBJECTIVES RELATED TO THE TECHNOLOGY

Network Description/Configuration

TNET, the U.S. Army's Teletraining Network, was selected as the communications technology for the FTP. The Network Control Center (NCC) for TNET is located at the U.S. Army Training Support Center (ATSC), Ft Eustis, Virginia. TNET is a two-way audio-video transmission medium using Compression Labs, Inc. (CLI) Gallery™ 235 VTT systems and Hughes Network Services (HNS) satellite communications.

The Gallery 235 is a stand-alone, modular video conferencing system that houses much of the equipment (Figure 3 shows TNET from the instructor's perspective; Figure 4 shows TNET from the classroom/student perspective). The TNET system consists of:

- an antenna and feedhorn (located on a satellite dish or very small aperture terminal (VSAT))
- an IBM PC dedicated to communication
- two 35-inch television monitors (one for viewing motion, one for graphics)
- a remotely controlled video camera mounted in the Gallery
- a unit for encoding and decoding the compressed digitized signal (CODEC) (CLI's Rembrandt II/06™)
- an indoor unit (IDU) to receive and process the satellite signal
- a desk-top control unit to handle transmission and reception
- audio equipment including table-top microphones for student use
- a multi-media (graphics) computer (origination site only)
- a graphics stand with camera (ELMO), and
- two uninterrupted power supply (UPS) units.

The HNS TELEconference™ System provides a flexible facility for VTT using a permanently assigned satellite channel for management and a shared pool of satellite channels scheduled to support video and audio communications among its users. The compressed and digitized signal is sent to SBS-5, a geosynchronous Ku-band satellite owned by HNS located above the Pacific Ocean near Hawaii. The digital transmission rate used was 256 kilobits per second (kbps).

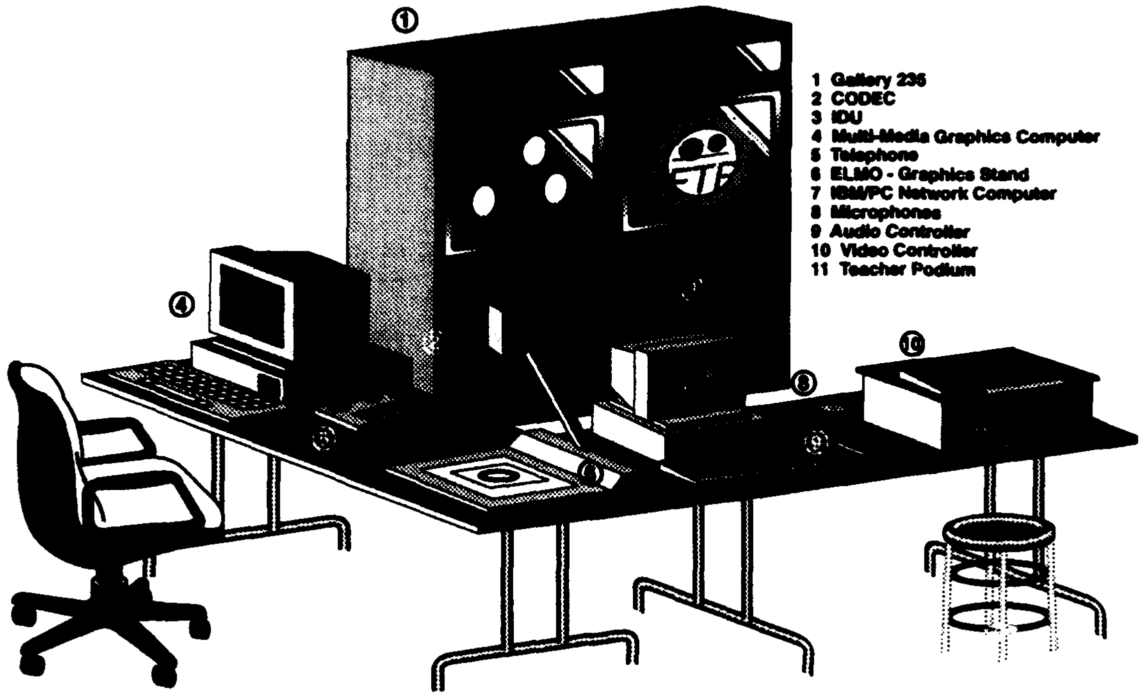


Figure 3. TNET from the instructor's perspective.

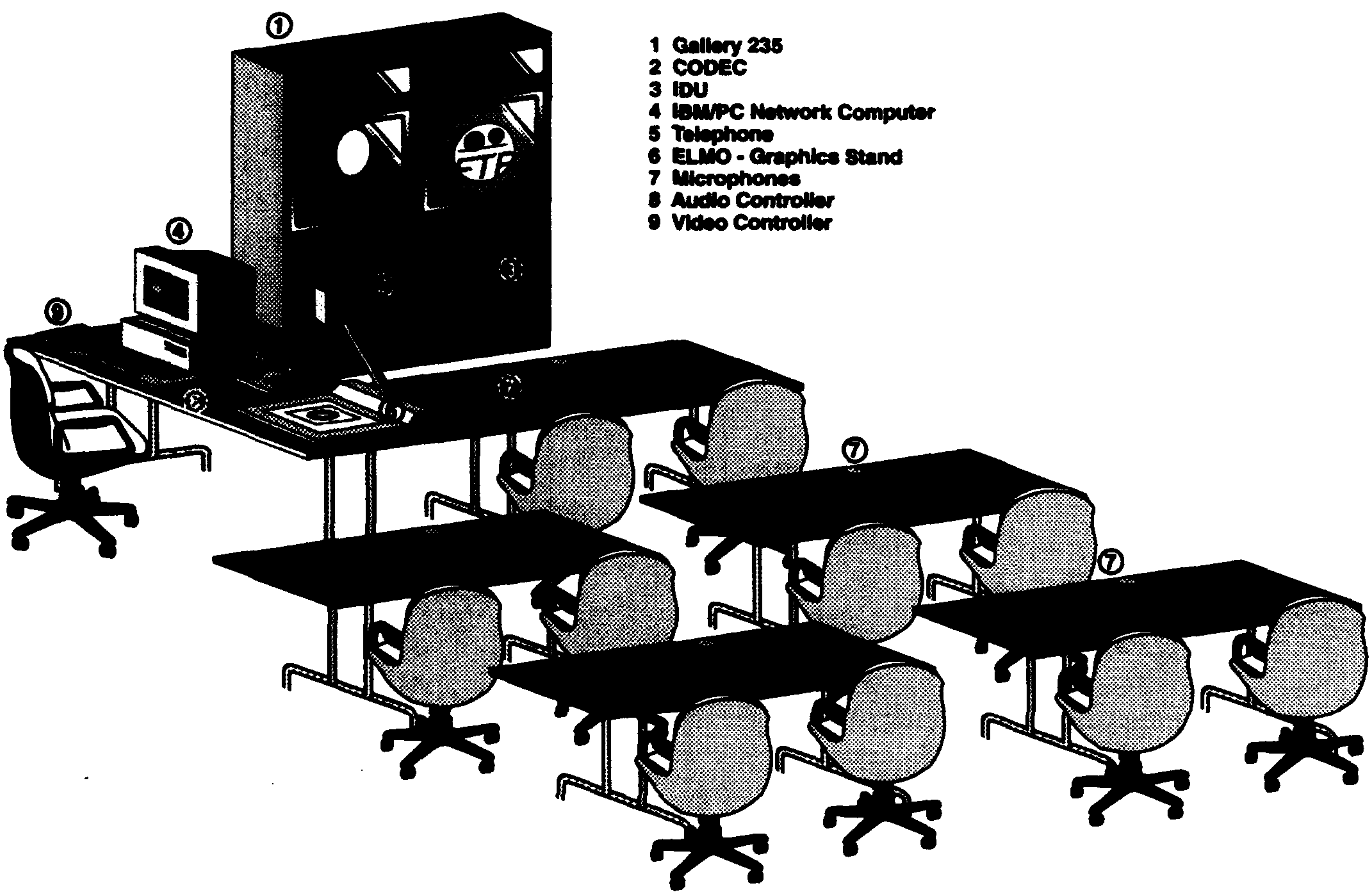


Figure 4. TNET from the classroom/student perspective.

TNET communication capabilities include:

- two-way video
- two-way audio
- point to multi-point communications
- year-round, 24 hour-a-day availability
- interactivity among a maximum of eight sites (1 origination, 7 receiving).

During a teletraining conference, audio and visual information is exchanged between two or more sites. Audio information is provided from microphones that pick up voice signals in the room. Visual information is provided from the motion camera mounted in the Gallery, an auxiliary camera such as that on the ELMO, computer generated graphics, or from some other source such as videotape. The audio and visual information, originally in the form of analog signals, must be converted to digital form (i.e., digitized) in order to be compressed into a single signal and transmitted.

The two-monitor system allows motion to be seen on one monitor, graphics on the other. However, only a single visual signal may be transmitted each way at any given time due to the channel size. When a graphic image is sent, the motion transmission is frozen for approximately four seconds. Motion resumes upon completion of the transmission of the graphic image.

Since all sites are identically configured, any site can serve as the origination site. To change the point of origination from one site to another, a procedure called "passing the baton" is performed using the IBM PC. It takes several seconds to pass the baton, but the procedure is useful if another site needs to become the origination site for an instructional activity.

The technical requirements for TNET are presented in the *TNET Handbook*, distributed by the NCC at Ft Eustis, Virginia when the equipment is installed at each site. This handbook provides a complete description of the system configuration and features, the system components, how to operate a teletraining conference, how to program the CODEC, and a set of troubleshooting procedures. NCC also specifies standard classroom equipment, room size and configuration, and room conditions for TNET use.

Network Guidelines

The number of sites, number of students at each site, and the complexity of the equipment necessitated that the project develop a set of procedures and guidelines that would insure the instruction was implemented as it was designed. For example, a maximum number of fifteen and a minimum number of nine students was established for each site to insure that the instruction was interactive and to accommodate the TNET equipment.

During instruction, use of the TNET equipment was coordinated through the Network Manager and Chief Engineer at FCCJ who in turn coordinated with NCC at Ft Eustis. The guidelines established for network use during the project are listed in Appendix C.

Findings from TNET Studies

Several comprehensive studies have been conducted using TNET. A number of these have been conducted in conjunction with the Defense Language Institute Foreign Language Center (DLIFLC) (Bramble, 1990; Bramble & Bauer, 1991, 1992). For example, DLIFLC investigated the use of computer assisted study (CAS) and VTT to address the language training needs of practicing military intelligence (MI) linguists. Three types of training technology were employed: CAS, VTT, and combined CAS/VTT. Bramble and Bauer (1992) made the following general conclusion, "the pilot tests demonstrated the potential of the CAS and VTT technologies to provide outstanding resources for on-site training for military linguists" (p. 103).

The findings from the DLIFLC German VTT pilot test (Bramble & Bauer, 1991) are indicative of the general findings regarding TNET when it is used for linguists training:

- VTT courses must be carefully preplanned and designed.
- Adequate training for site facilitators and instructors was necessary. This included both training in the technology, in new instructional techniques, and for on-camera teaching.
- The equipment and communications links were sufficient to support VTT training. However, contingencies were needed in the event of equipment failures.
- Army National Guard MI linguists met the instructional objectives.
- Participants were highly satisfied with the superior quality of the course and the instructors. They judged the course to be interesting and motivating.
- The media available with the system provided an excellent media mix for language instruction.
- The accessibility of the training to students was high.
- VTT has the potential to support nonresident military language training.

Another major study involved TNET instruction for the Basic Non-commissioned Officer Course (BNCOC) Common Leader Training. This course was designed and delivered to the Kentucky Army National Guard. The purpose of the study was to determine if VTT was as effective as traditional instruction for the RCs. The course was designed using the word picture approach (Cyrs & Smith, 1990). One goal of the program was to foster interaction between the instructor and students and to use a variety of interactive and highly participative techniques, such

as group exercises and role plays. The POI and tests were the same for all the groups. TRADOC (1992) concluded, "VTT worked, students liked VTT, instructors like VTT, VTT test scores were as good if not better than traditional test scores, and reconfigured materials produced higher posttest scores than traditional materials."

Four of the objectives of the FTP were directly related to the VTT technology itself. These included determining its reliability, determining the military's acceptance of the VTT approach, determining the success of the technology in providing a viable means for students to access the training, and determining how appropriate the VTT system was for providing the courses. Each of these objectives is discussed in detail in the following sections along with a discussion of the results from the data collected.

Objective A1
Determine the Reliability of the Equipment and Communications Links Required for the VTT Courses

An important concern for the DoD is whether or not the TNET system is reliable enough to provide a viable means of effectively conducting VTT courses. To determine this, data were collected and analyzed from technicians' logs and from questionnaires presented to students and instructors regarding their opinions of the effectiveness of the technical equipment.

Data from Technicians' Logs

Site technicians were asked to keep a log of each equipment disruption or outage that occurred during the training sessions. A disruption was defined as a breakup or interference in the video or in the audio. For example, some disruptions were as minor as static appearing on the video display. These disruptions lasted only a few seconds at a time and in most cases resulted in only minor distractions to class instruction.

An outage was described as a loss in both the audio and video transmissions. Thus, an outage was considered to be more severe than a disruption. Outages could occur for any length of time (e.g., a minute, hour, or day).

In the 422.5 hours of transmission time, transmission loss occurred for a total of 1.63 hours. This indicates that the TNET system was over 99% reliable for all five courses. A series of contingency plans had been established to insure that instruction was continuous and effective in the event of any outages not under project control. These were published in the Instructor's Guide (IG) and the Instructional Coordinator's Guide (ICG). In the event of a failure of any kind, the Instructional Coordinator (IC) at each site knew how to continue the instruction. However, due to the reliability of the system, these contingency plans were rarely used. Table 4 describes the number and duration of outages which occurred during each course.

Table 4
Frequency and Duration of TNET Outages

Course	Transmission Hours	Number of Outages	Outages in Hours
71L10	115.00	3	.58
76Y10	136.50	0	0
95B10	109.00	1	.58
HAZ	47.25	0	0
TQL	14.75	0	.47
Totals	**422.50**	**4**	**1.63**

Transmission disruptions were also recorded in the technician logs. As described previously, these disruptions involved interference in the video and/or audio signal, but did not result in the loss of video or audio. They were categorized according to their causes which included: weather, loss of power, equipment failure, personnel or human error, audio signal interruption, or video signal interruption. Out of 30 total disruptions, 16 (52%) involved problems with the video. The majority of these were easily corrected by boosting the video transmission signal. They had a negligible effect on class instruction. Figure 5 illustrates the frequency of each of these categories of disruptions.

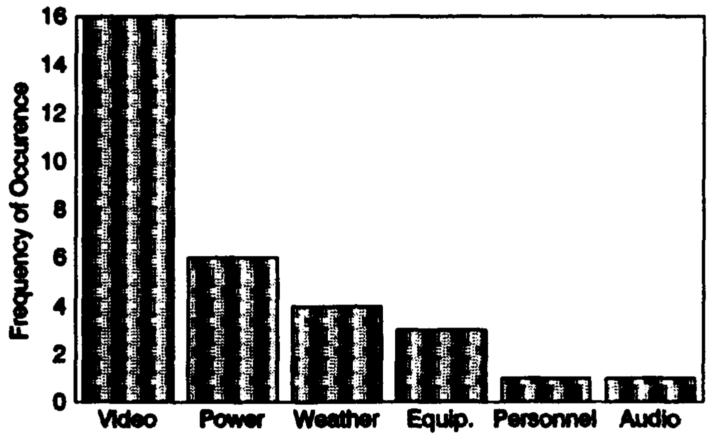


Figure 5. Frequency of transmission disruption causes

Data from Students and Instructors

In addition to the technicians logs, students were asked to rate the quality of the audio and video in each course using a 5-point Likert scale. Table 5 provides the means. All means show that the perceived quality of the audio and video was *very good* (4.0).

Table 5
Means of Students' Perceived Quality of Audio and Video

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Audio Quality	4.17	4.28	3.95	3.95	4.28
Video Quality	4.01	4.37	4.03	3.99	4.28

In addition, students in the MOS courses were asked whether they felt the technical equipment functioned as effectively as they would have liked. Figure 6 indicates the percentage of students who responded *yes* to the question.

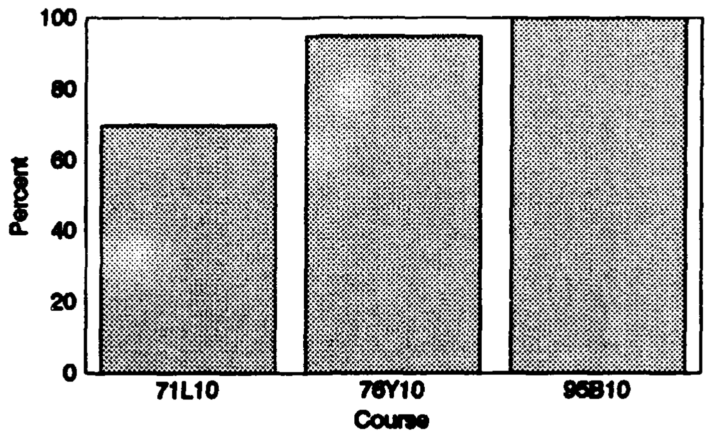


Figure 6. Percentage of positive student responses concerning the technical efficiency of the equipment.

Instructors of the MOS courses were also polled as to their opinions regarding the quality of the audio and video. Ratings were obtained using the same 5-point scale used by the students. The mean response for the technical quality of the audio was 4.0 which indicates that the instructors felt the audio was *very good*. The mean response for the technical quality of the video was 4.33, again indicating the instructors gave the video quality very favorable marks.

In summary, the data from the technicians' logs and the responses from students and instructional personnel indicated that TNET functioned very effectively. The reliability of the equipment is important to the success of any VTT program and TNET was a reliable system during the FTP.

Objective A2
Determine the Target Communities' Acceptance of the VTT Approach to Course Delivery

The purpose of this objective was to measure the reactions of service members regarding the use of VTT technology to deliver the instruction. This objective was defined as the students' acceptance of technology rather than acceptance of the teaching and learning activities associated with VTT.

Data from Students

A variety of questions were asked to determine the students' feelings toward the effectiveness of the technology and their perceptions of the effect of distance between the instructor and students at the remote sites. In addition to measuring student reactions to the technology, questions related to the students' acceptance of VTT technology were also posed to the MIAs and the MSCs.

Students were asked to rank order their preferred method of receiving instruction. Figure 7 illustrates the mean results from this question. Instruction via VTT at a community college had the highest mean of any other method of instruction, ranging from 3.58 in 76Y10 to 4.01 in HazWaste. VTT instruction at an armory or reserve center had the second highest ranking.

Students were also asked an open-ended question about what they liked best about VTT instruction. Of the 79% of the students in all courses who responded to this open-ended question, 23% stated that the technology was the aspect of the instruction that they liked the best. Student responses fell into six broad categories in terms of what they liked best: the instructor, the community college atmosphere, the technology, the course materials, the travel, and other.

When asked an open-ended question about what they liked least about this form of instruction, 79% of the students responded. The percentage who indicated that technology was the aspect of the course that they liked the least ranged from 0% in the 95B10 course to 3% in the 71L10 course. Thus, the data indicate that students were very positive regarding the technology involved with VTT instruction.

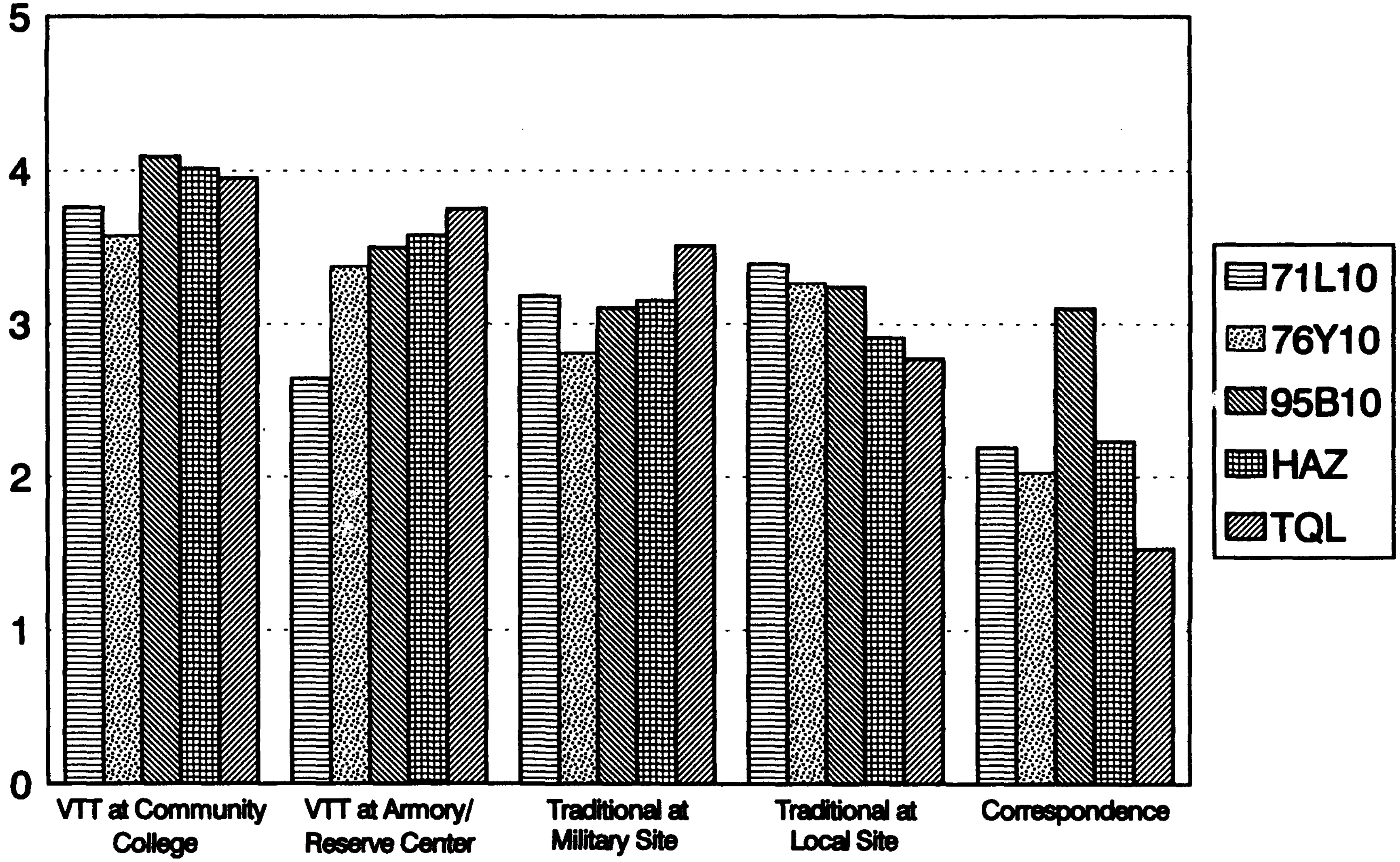


Figure 7. Student Rankings of Possible Training Options

Students were also asked whether they believed their class was as effective as a live class not delivered by VTT. In 4 of the 5 courses, over 75% stated that the VTT instruction was as effective. The percentage of students responding *yes* ranged from 54.8% in 71L10 to 84.1% in the HazWaste course (Figure 8).

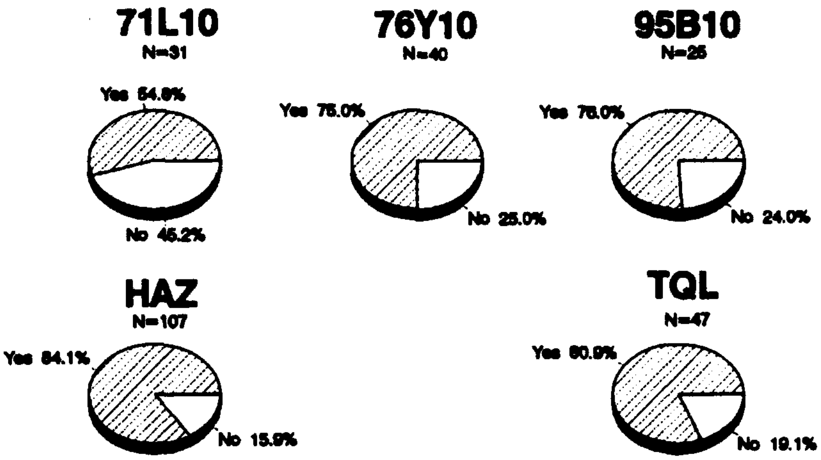


Figure 8. Student Acceptability of Approach

Students were also asked how they felt about the physical distance separating them from the VTT instructor. Since physical distance between the student and the instructor is a characteristic of all distance learning technologies, measuring the students' responses to this item is, in part, measuring the students' acceptance of the technology. The percentage who perceived distance as a problem ranged from 2.2% in the HazWaste course to 21.27% in the 71L10 course (Figure 9).

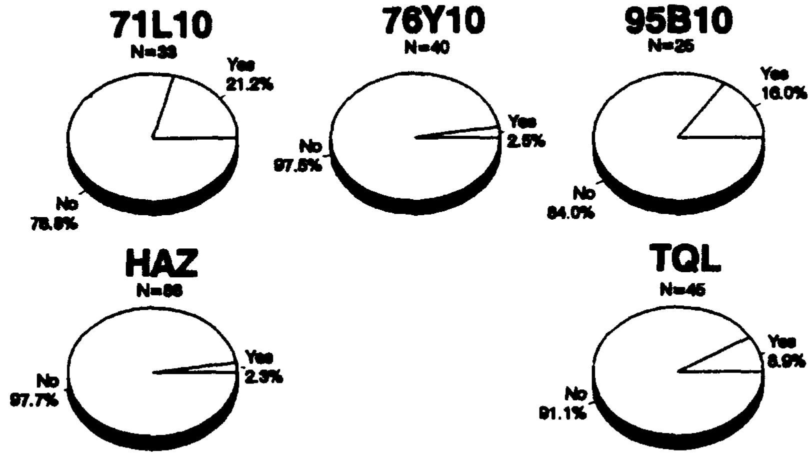


Figure 9. Students Reporting Problems with Physical Distance

When asked to select from a 5-point Likert scale the rating that best reflected their attitudes toward taking another military course by teletraining, student responses ranged from a mean of 3.78 in the 71L10 course to a mean of 4.54 in the TQL course (Figure 10). In a related question, posed only to students taking the TQL course, students were asked if they would encourage others to take a course by VTT. Thirty-seven students were asked if they would recommend a VTT course to a friend, with 86.5% indicating that they would.

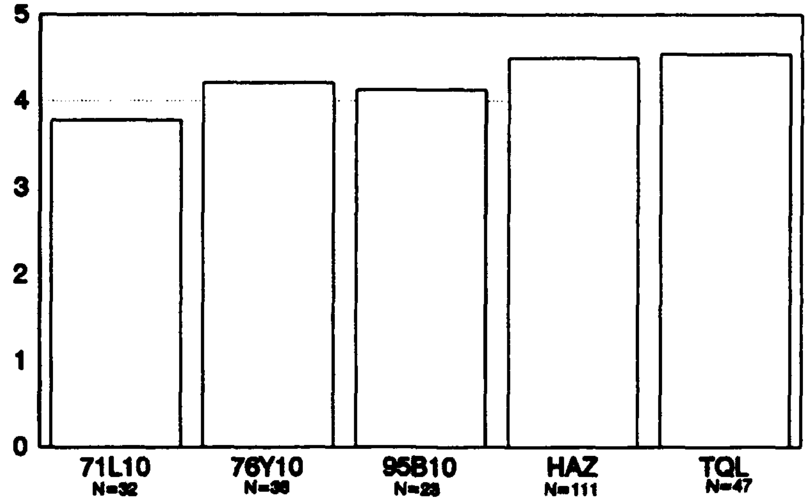


Figure 10. Students' Attitudes Toward Additional VTT Courses

Data from Instructional Personnel

The MIAs at the FCCJ origination site were asked whether they would like to teach more classes by satellite and VTT. Two of the three MIAs responded to this question by stating maybe. One MIA responded by saying yes. All three MIAs cited non-technical issues, such as too many visitors during transmission and high stress levels due to mistakes in the proponent school supplied materials, as drawbacks to VTT teaching.

The nine MSCs in the Army MOS courses (3 at each site) were asked their opinions of the students' perceptions of the training. The purpose of the question was to decide if the students had reported problems to the MSCs that they did not share with the civilian evaluators either on questionnaires or in personal interviews. Six of the MSCs reported that the students had positive feelings toward the VTT approach, but they also cited some problems that the students experienced adjusting to the technology. Positive narrative comments ranged from "The students forgot it was a box after awhile," to "While the students were impressed (by the technology), viewing VTT caused eyestrain." Three of the MSCs reported that they did not feel the students reacted positively to the technology. One MSC in the 95B10 course stated that the "students were bored staring at the screen."

In summary, both students and the instructional personnel accepted the technology. Students felt VTT was as effective as a live class and that the distance separating students and instructors did not detract from the instruction. Likewise, the instructional personnel were generally positive about the technology even though several of them reported that care must be taken to insure that the instruction is not boring.

Objective A3
Determine the Success of the Technology in Providing a Viable Means for Students to Access the Training

One objective of the FTP was to determine if teletraining could increase the availability of the military courses to the student population. The benefits that occur as a result of the increased accessibility of the courses must also be weighed against the costs incurred while establishing a teletraining course. Data were collected from students regarding the distance that they had to travel to reach the teletraining site, and whether they commuted daily to the course, or were locally housed for the duration of the course.

Data from Students

According to the Joint Travel Regulation (JTR), students who live farther than fifty miles from a course site are eligible to receive billeting and meals or per diem throughout the duration of each course (students living less than 50 miles away were eligible to receive per diem for meals only). Thus, if teletraining increases the accessibility of courses to students, then more students should be able to commute locally rather than be billeted for a course period, resulting in a more cost effective training program. With this in mind, each student was asked to complete a survey that requested an estimate of the distance in miles from their home to the classroom site and whether they commuted daily to the course site or had to be housed locally for the duration of the course.

The three MOS courses (71L10, 76Y10, 95B10) were selected partly because a large population had been identified as needing these courses in the selected TNET remote site areas. However, as the courses were being developed for teletraining, this target population decreased. The researchers found that not enough students were available in the TNET site local areas when the courses were scheduled to occur. To maintain the integrity of the experimental evaluation, it became necessary for students from outside the immediate areas to travel to the TNET sites. In some cases, students living near one TNET site were required to commute to another remote site rather than attend the course locally. Thus, the accessibility data is significantly confounded. In fact, the mean distance traveled by students was 90.2 miles (95B10), 164.08 miles (71L10), and 215.48 (76Y10) miles. Accordingly, the mean travel time for students was 1.72 hours (95B10), 2.36 hours (71L10), and 3.29 hours (76Y10). This data indicates that it was not feasible for the majority of the students to commute daily from their home to the remote site. These students had to be housed locally. Figure 11 shows the percentage of students who commuted to a course held at a local TNET site versus those who had to travel to a remote site and be housed for a course.

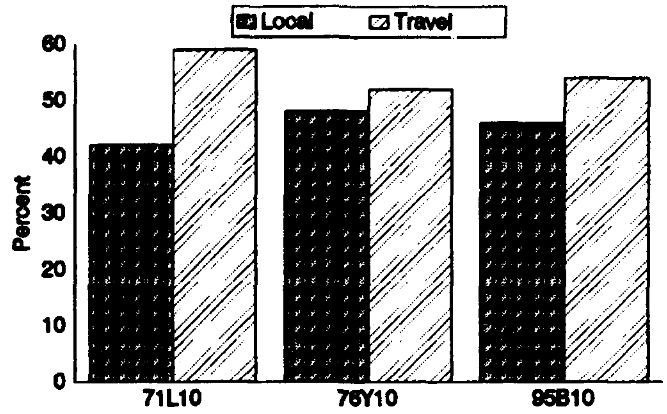


Figure 11. Percentage of students who commuted daily vs. those who traveled to remote site.

In summary, due to the experimental requirements of this project, the data for this objective were confounded. Accurate conclusions about access cannot be drawn. Conceptually, however, while teletraining is believed to increase the accessibility of training, it is not without costs. As discussed earlier, this technology should allow a decrease in costs by providing sites to which students can commute. Therefore, there should be a decrease in billeting costs and per diem as a result of the increased availability of courses. However, this savings must be weighed against the significant expenditures that were incurred to establish TNET sites. Thus, the cost effectiveness of this technology involves comparing the equipment costs to the savings that occur as a result of less travel costs. It should also be noted that VTT technologies come in many varieties; costs of the equipment can vary. VTT costs may change if alternate technologies become available.

Objective A4
Determine How Appropriate the VTT System is for Providing the Training

The purpose of this objective was to determine how well suited the courses chosen for the project were for presentation via VTT. The appropriateness of each of the five courses was evaluated: (a) based on review of current research regarding course selection for VTT, (b) by analyzing additional factors such as the number of off-line activities and the stability of the course content, and (c) by student perceptions of the appropriateness of the courses for VTT presentation.

In selecting courses for VTT delivery, demand (throughput) is often a significant concern from a cost perspective. In the case of the FTP, the military selected the five courses primarily because of the high population in Florida requiring these courses. The MOS courses were chosen because soldiers needed to be qualified in these particular MOSs to fulfill important military roles and functions within their assigned units. In addition, other factors were taken into consideration when these courses were selected. These included the expense involved in sending soldiers to proponent schools, RC soldiers' employment schedules, whether or not the students' work schedules would allow them to take an 8-10 week course, and when classes were scheduled at the local USARF schools, National Guard Academies and the proponent schools (e.g., some classes might not be offered until the following year). Likewise, the Navy considered the HazWaste and TQL courses to be very important; the content was needed by a large number of personnel. The Navy courses were also selected because of their potential interest to multi-service audiences.

The Navy prefers to present courses no longer than one-week in length via its teletraining system (CNET Handout, 1992). The three MOS courses were presented during a two-week, 80-hour training period. Although the MOS courses were longer than the Navy recommendation, the instruction contained numerous off-line activities that helped to breakup long periods of VTT presentation. The special topics courses, HazWaste and TQL, were presented as one-day workshops.

An additional factor regarding the appropriateness of the courses for VTT was the number of off-line activities that could be designed for the course. The fact that the MOS courses were presented during a two-week block had the potential of being problematic because students could not be expected to attend to continuously televised instruction for that length of time. However, two of the courses, 71L10 and 95B10, included psychomotor skills (e.g., typing, demonstrating MP search procedures); all five courses had practical exercises (PEs) as required course components that allowed (and sometimes required) students to go off-line for hands-on practice for varying periods of time. The FTP course developers used these off-line exercises as a method to alleviate any boredom or lack of attention that might occur as a result of listening to eight hours of instruction. Off-line activities also provided interactivity for the students, enabled them to practice what they had learned, and provided a means for the students to interact with one another.

Finally, stability of the lesson content found in the courses was also a consideration of appropriateness for VTT because courses that have frequent content changes are not typically

good candidates for VTT (or for any mediated delivery strategy). This is because course resources can become outdated too quickly to make the design and development process cost effective. Two courses in the FTP study, 71L10 and 76Y10, had regulations that were expected to become outdated. To eliminate this potential problem, the FTP course developers omitted the regulation numbers and pamphlet numbers from the student guides and from the graphics so that students could write in an updated version number as the course was presented. The instructor and the site facilitator guides had regulation and pamphlet numbers printed in them so the instructors would have a ready reference. In this way, the graphics could be reused without being out-of-date and students had a visual cue that the regulation numbers may change (the regulation number had to be written in).

Based on a review of the POIs and syllabi, a preliminary examination of the five selected courses was performed in an effort to determine how well they fit five important guidelines for course selection. Table 6 provides the results of this overview.

Table 6
Course Characteristics for VTT Adaptability

[illegible]	[illegible]	Psychomotor Component	High Throughput	Stability of Material	[illegible]
71L10	Yes	Yes	Yes	Yes	Yes
76Y10	Yes	No	Yes	No	Yes
95B10	Yes	Yes	Yes	Yes	Yes
HAZ	Yes	No	Yes	Yes	Yes
TQL	Yes	No	Yes	Yes	Yes

Data from Students

In an effort to assess the students' perceptions of the appropriateness of the technology, students were asked for what types of courses they felt the technology was most appropriate. The narrative data were then analyzed and categorized according to commonalities. In the 71L10 course, a total of twenty-five students responded to the question. Fourteen of the respondents (56%) stated that they felt VTT was best suited for courses that were administrative in nature or dealt with "paperwork" (primarily cognitive). Twenty percent of the students made comments that VTT would not be good for courses that required "hands-on" (psychomotor) training.

Twenty-nine students in the 76Y10 responded to the question. Fourteen students (48%) stated that they felt that VTT was best suited for administrative courses. An additional seven students (24%) stated that they did not think VTT was appropriate for courses that were "hands-on" in nature.

Students in the 95B10 course had perceptions similar to those in the 71L10 and 76Y10 courses. Twenty-five students responded to the question. Six of the students (24%) mentioned that they felt VTT was useful for teaching administrative type courses. Eleven students (44%) believed that VTT was not useful for teaching "hands-on" type courses. Table 7 shows the results of the analysis of the narrative data relating to student perceptions of the appropriateness of the VTT.

Table 7
Student Perceptions of VTT Course Appropriateness

[illegible]	Administrative	No "Hands-On"	Other
71L10	56%	20%	24%
76Y10	48%	24%	28%
95B10	24%	44%	32%

In summary, the five FTP courses selected for VTT instruction were assessed as generally appropriate for the technology. The psychomotor or "hands-on" aspect of a course has been reported in the literature as being potentially problematic and the students in the MOS courses concurred by stating their concerns about "hands-on" courses. However, the psychomotor aspect of the FTP courses allowed course developers to design useful and appropriate off-line activities. This was useful for breaking up long periods of instruction.

Conclusions Regarding Technology

These objectives have addressed potential concerns related to the technology required to deliver VTT courses. The data collected support the high reliability and quality of the TNET equipment, finding it to be over 99% reliable in terms of number of disruptions and outages that occurred during this project. Students and instructors were apparently pleased with the quality of the audio and video as they found it to be above average.

Furthermore, based on the sample students chosen for the pilot study, it would appear that there is a general acceptance of the VTT approach within the target community. The students generally liked the VTT approach better than the other training options available to them (e.g., traditional training at a military site, traditional training at a local armory or reserve center, or correspondence courses) and expressed a preference for VTT at a community college over VTT at their local armory or reserve center. Students also indicated that they would take additional VTT courses.

The data collected in an effort to determine whether teletraining provides more accessibility to training were confounded by the need to maintain experimental integrity by requiring a minimum number of students per course site. Therefore, the results of this project cannot be used to support or refute the idea that teletraining provides more access to training for students. However, in theory it should provide better access.

The five courses selected for the FTP were determined to be generally appropriate for VTT presentation according to the guidelines outlined in previous research (McDonald, et al., 1990; CNET Handout, 1992). All five courses were of short (two weeks or less) duration, were primarily cognitive (although two courses had psychomotor content), and provided enough throughput to satisfy military needs. Four of the courses had relatively stable content and all provided opportunities to break up the VTT presentation by using off-line activities. Student responses tended to validate the adapted models used by the project to determine the appropriateness of the courses for VTT. The students perceived VTT as being appropriate for courses dealing with administrative subjects (cognitive tasks) and having little psychomotor content.

Issues to Consider

An issue to consider when assessing the reliability of the TNET equipment is that it is sensitive to certain inclement weather conditions such as fog, rain, and snow. Such inclement weather at a site location can result in transmission being interrupted or severed entirely. This is due to atmospheric disturbances that weaken the TNET signal being transmitted from the satellite before it reaches the destination site. Often, this problem can be alleviated by boosting the wattage of the signal being uplinked to the satellite; the resulting reflected signal is of sufficient strength to produce a transmission without any interference. The normal TNET power level is 1.5 watts, which can be boosted to a maximum of 3 watts, if necessary. However, serious rain or snow storms can result in transmission being lost entirely. Given that atmospheric disturbances can disrupt satellite transmission, land lines may be considered as a possible alternative.

Another issue related to equipment reliability is the role of the technician during teletraining. Site technicians were present at all sites during each of the five courses. However, due to the high reliability of the equipment, the technicians' expertise was rarely needed except at system startup and shutdown. Each site was also provided with troubleshooting procedures for audio and video problems as well as guidelines for starting and shutting down the equipment. When determining the personnel required to provide a teletraining course, it is necessary to assess whether a technician is needed full-time or if someone else can be trained in the startup and shutdown procedures with a technician available for emergencies. During the delivery of one course in this project, two of the sites were run without the aid of technicians. Two IST researchers were trained in operating and troubleshooting procedures; they also attended a workshop on TNET. While they did not have the expertise of the site technicians, they were able to operate the equipment effectively. However, they felt that it was necessary to have a technician available in the event they had a question. In one instance, the researcher was able to telephone a technician at the NCC in Ft Eustis who then provided instructions on how to resolve a problem. This was accomplished in a matter of minutes. This problem occurred during startup, thirty minutes before class, so no disruption of instruction occurred. However, in the event of a major outage, a technician might be necessary. The trade-off between hiring a technician and accepting the possibility of an outage is an issue that should be taken into consideration when planning to use any VTT equipment. Instructional contingencies may be effective in some instances and should be included in teletraining course planning.

Another issue that must be considered when determining the viability of teletraining as it relates to equipment reliability is: how long can a system outage occur before the lost instruction becomes irretrievable? This question was not answered by the current study, as none of the outages that occurred had a major impact on the instruction. AETD was asked this question and they were unable to give a definitive answer. While it is expected that a complete loss of instruction would be a rare occurrence, it might be necessary to develop contingency plans to address this issue.

When addressing the acceptance of VTT, one issue to consider is whether acceptance is a result of the novelty of the technology. Clark and Salomon (1986) have observed that new technologies are likely to be more acceptable initially because they generally provide better prepared instructional materials and the novelty of the technology tends to better engage student interest.

Student acceptance is only one hurdle that VTT must overcome to be a viable military training option. How the VTT approach fits into the overall training system is an issue of much concern to the training community. During the instructional personnel training sessions held in Jacksonville, USARF personnel asked several questions such as "What will happen to the USARF schools if the Army adopts VTT as the primary means of reclassifying RC soldiers?" and "What will happen to the USARF school personnel if the schools are deactivated because civilian institutions are conducting the training traditionally delivered by the USARF schools?" The importance of these questions is that many personnel involved in formal individual training at Reserve Component Training Institutions (RCTIs) (USARF schools, National Guard Military Academies) perceive VTT as a threat to their positions and their institutions. To foster acceptance of VTT among trainers and leaders in the military, plans must be formulated to reduce

organizational resistance to the institutionalization of VTT. These programs should focus on the benefits of VTT to service members and leaders, while minimizing fears regarding "rice bowl" issues.

In a letter to the FTP Manager, the Adjutant General of Florida provided this assessment of the project:

> "Community college instructor support appears redundant and ineffective in that USARF instructors were assigned at all locations to handle student questions and concerns that the civilian instructors did not have the depth of knowledge to handle. Proponent school instructors or USARF instructor personnel, with proper technological training, can provide *in depth* instruction using the Army TNET system already in place. The location of downlink classrooms at local community colleges is not essential to the success of teletraining. Equipment placed in unit armories and at the Camp Blanding Training Site would be more cost effective and more readily available to our soldiers."

To summarize this concern, the purpose of VTT needs to be formally established in relation to other training options, e.g., how will VTT fit with other training options? What types of courses will be taught using VTT? Instructors and other RCTI personnel should be informed that they can also be trained to deliver VTT instruction.

When selecting courses to be taught using this technology, courses must be chosen considering the projected *student populations in the remote sites.* This was a lesson learned during the FTP where the courses were selected considering the population existing at the time of project startup without projecting the population at the time of the implementation. The larger the student population that can be served using teletraining, the greater the potential cost savings. An on-going VTT program might eliminate this problem.

Finally, the selection of a course containing some psychomotor components for VTT may, in fact, be useful because the off-line activities may serve to make the instruction more interesting by breaking up long periods of lecture/conference. However, the inclusion of off-line activities may be an inefficient use of limited satellite time. Conducting off-line activities may cause scheduling problems for large scale networks with many different types of courses being delivered across several time zones. New instructional strategies and learning activities must be developed to break-up long periods of VTT instruction in courses where off-line activities are inappropriate. Courses that have shorter daily instructional periods (2 hours per day as opposed to 8 hours) may not need extensive off-line instructional activities.

OBJECTIVES RELATED TO INSTRUCTION

Course Reconfiguration Process

The five courses selected for VTT delivery had to be converted from the standard mode of platform delivery to VTT delivery. The five-component SAT model was adapted for use in reconfiguring the courseware. In the adapted model, the five functions of the SAT were included (i.e., Analysis, Design, Development, Implementation, and Evaluation) and two functions were added, Revise Instruction and Management. The adapted model is based on learning and instructional theory and is presented in Figure 12 with some associated tasks.

The major tasks completed during each phase were as follows:

Analysis Phase. This phase would normally involve analyzing courses and selecting those suitable for presentation over TNET. However, the five courses that were reconfigured during the FTP were assigned by the government. Therefore, traditional tasks performed during the analysis phase of the SAT model were not conducted during this project.

Design Phase. During this phase, the POIs and syllabi were analyzed to determine the adequacy of the course materials from an instructional design perspective. In order to begin reconfiguring the courseware, course developers wrote or modified objectives and criterion-referenced tests, identified the conditions of learning and events of instruction (Gagne, 1985), selected media mixes for objectives or groups of objectives, identified all the military materials and equipment needed to conduct the instruction, and determined student entry behaviors. In addition, global media and instructional strategy selections were made that would facilitate student learning and that matched the instructional conditions for VTT.

Development Phase. The major activities of the Development Phase were to develop and produce the instruction. All course materials were developed during this phase of reconfiguration: IG, ICG, the ISG, screen graphics and word pictures, and support media (e.g., videotapes, charts). In order to produce these guides, lesson plans were developed and surrounding materials (e.g., introductions to the guides and classroom protocols) were written and produced. Also during this phase, initial pilot testing of the courseware was conducted and validation and approval of the courseware from the responsible military organization was obtained.

Implementation Phase. Preparation for the delivery of instruction and implementation of the courses were the primary goals of this phase of the reconfiguration process. The primary tasks performed were: acquiring military materials and equipment, acquiring instructional equipment, scheduling labs and facilities at the remote sites, organizing for instruction (e.g., planning for contingencies), preparing paperwork and recordkeeping to be used during instruction (e.g., visitor's logs and TNET logs), producing sufficient quantities of course materials, delivering the courseware to the remote sites, preparing the staff to implement the instruction, and the actual delivery of the instruction.

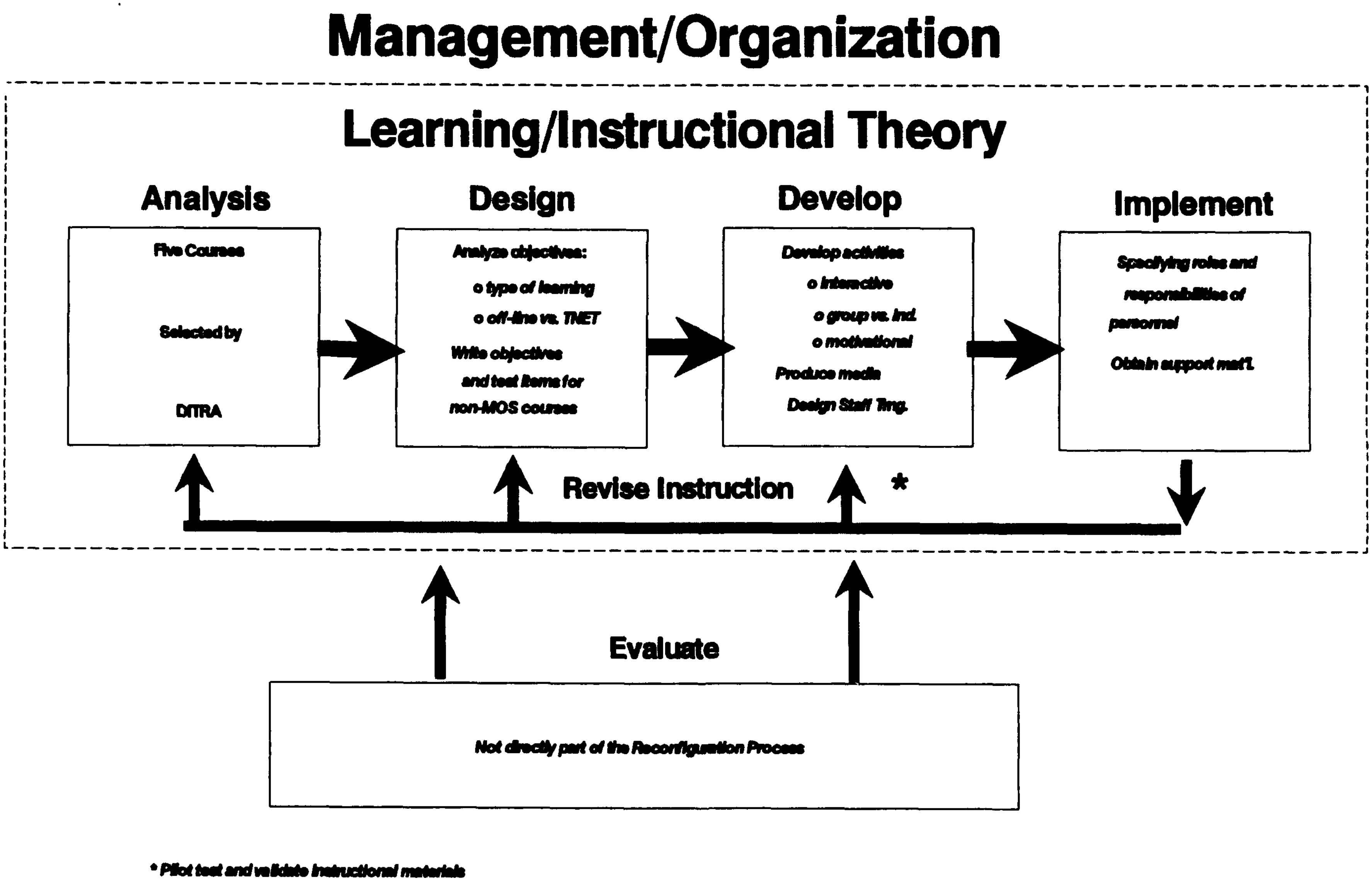


Figure 12. Sample Tasks in the Reconfiguration Process

Revise Instruction Phase. This phase was added to the adapted model because several revision and validation cycles had to be performed during the reconfiguration process. The functions of this phase were ongoing:

- During the Design phase, minor modifications were made to the military POIs and syllabi to align the objectives, performance test items, and practical exercises.

- During the Development phase, process (e.g., readability) and product (e.g., performance) data were collected during several expert reviews of the print and non-print course materials, and during trial runs of some key instructional strategies. Prototype units were validated by the appropriate military organization. Final versions of the course materials were prepared during this phase.

- During the Implementation Phase, a pilot-test site, called an Intensive Site, was established at the remote site, FCCJ2. The purpose of this site was to collect data so that the courses could be modified and revised during delivery. Final courseware revisions were made to each course after the training was delivered.

Management Phase. Three primary groups of people with a web of complex relationships among them had to be coordinated for the success of the project. The project director at IST and the project manager at DITRA were responsible for this coordination. These groups included: (a) the design, development, production, implementation, and evaluation teams, (b) the military organizations and groups involved in the project, and (c) the three community colleges.

Evaluation Phase. A considerable amount of data was collected during delivery of the courses. One of the roles of project personnel was to collect data from students and instructional personnel. These results are presented in this document.

Course Delivery

Instruction is presented *live* over TNET. At the origination site, the primary person responsible for content presentation was the VTT Instructor. The content of the courses, however, required that the MIA (who was also an SME) deliver some of the content. During delivery, up to three people were needed to implement the instruction. While the VTT instructor was presenting, it was necessary for the MIA to operate the ELMO because of his/her content expertise. A third person operated the graphics computer.

At each remote site, a community college site coordinator, who was also the IC, was needed as the instructor of record for each course. The IC also performed some of the off-line instructional roles. For the MOS courses, a MSC was also required. The IC and MSC were the VTT instructors' representatives at the remote sites. It was their responsibility to manage the instructional activities at each remote site.

The MSC was also responsible for recordkeeping, adhering to the off-camera course schedule, distributing and maintaining instructional materials (e.g., regulations, pamphlets), evaluating off-line exercises, sending course materials back to the VTT instructor, and conferring with the on-camera instructor. For the 95B10 course, the MSC also performed some instructional roles and graded some of the off-line activities. The IC performed these roles during the one-day special topics courses. In these courses, students were not being formally certified so the military role could be performed by community college personnel. A set of protocols was developed to coordinate instructional events during course delivery, including who was responsible for directing and evaluating military examinations, how the TNET gated audio was to be used, and describing the purpose of the after action review (AAR).

The MIA functioned as the Non-Commissioned Officer in Charge (NCOIC) for the course, and the MSC functioned as the NCOIC for each site. The MIA as NCOIC was the overall authority for course content, the lead USARF school's commandant's representative, and as such had the authority to grant leave. The MSC as NCOIC was responsible for logistics and personnel functions (e.g., military pay and allowances, billeting, orders, and health and welfare of the troops) in addition to his/her instructional duties.

Course Delivery/Training Schedules

A detailed course delivery schedule was developed for each course and included in the IG, the ICG, and the ISG. The training schedule was a daily listing of all events including who, what, when and where for all project and course related activities. A sample training schedule used for TQL is included in Appendix D.

Objective B1
Determine Whether the Students Met the Stated Learning Objectives as a Result of the VTT Instruction

The purpose of this objective was to provide evidence that the students taking the VTT courses mastered the training objectives that were either: (a) stated in the POIs of the MOS courses or (b) developed from the syllabi of the special topics courses. One requirement of the FTP was that the exact performance measures used in the RC^3 courseware for the MOS courses (71L10, 76Y10, and 95B10) be used to assess student performance during the VTT instruction. For the special topics courses (HazWaste and TQL) the VTT instructors and MIAs derived the performance measures from the stated learning objectives of the courses. Since these two courses were adapted from longer courses, there were no prepared performance measures that could be used.

Percentage of Students Passing the Performance Measures

MOS Courses. Students completed the same performance tests (PTs) that were administered to those taking standard RC^3 courses. There were four performance measures given for 71L10, six for 76Y10, and 35 for 95B10. These are listed in Tables B1.1, B1.2, and B1.3 in Appendix E. Also included in these tables are the percentage of students who passed each PT on the first attempt, the means and standard deviations of the students passing on the first attempt, and the percentage of students who passed the PTs on the retest. A summary of the data, giving the percentage of students who passed all the PTs in each course on the first attempt is included in Figure 13.

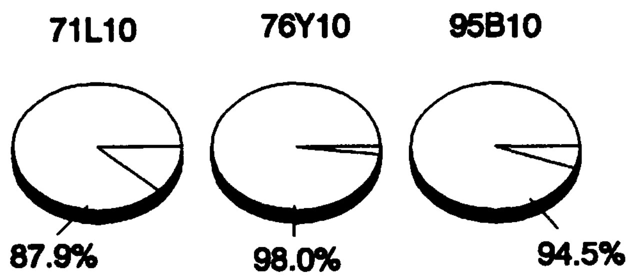


Figure 13. Average Percentage of Students Passing All PTs on the First Attempt in MOS Courses. *

* Note: 100% of students passed the three MOS courses.

Over 85% of the students in the three MOS courses passed all the PTs on the first attempt and 100% of the students passed the courses. These results indicate a high rate of success for students in the MOS courses. With the exception of the students who had to retake the typing test (this option was given to all students who did not master typing during 71L10), all students were certified in the course they took.

Special Topics Courses. Students in each of the special topics courses took a 20-item multiple-choice test devised by the community college instructor and the MIA. These tests were approved by the appropriate agency, but the tests were not used for certification. There were no provisions for retesting. The means and standard deviations are listed in Table 8. For the HazWaste course, the mean score was 78.23. For the TQL course, the mean score was 82.90.

Comparison of Pretest and Posttest Data

Pretest and posttest measures were administered in all courses except TQL. Due primarily to time constraints, only selected PTs, or selected items from the PTs, were administered as a pretest.

For the 71L10 course, four performance measures and a timed typing test were given to students. However, only the first PT, Type a Memorandum, was completed by all students. That performance measure and the timed typing test were used as the pretest and posttest measures.

For the 76Y10 course, a 50-item achievement test was used as the pretest and post measures in lieu of the PTs. The achievement test had been previously developed and used at the 3391st USARF by the MIA for 76Y10. The test was revised and used as the pre-post measure for this course.

For the 95B10 course, all of the multiple-choice items administered as PTs were used as the pretest. These items were compared to the same items taken on the PTs.

For the HazWaste course, a 20-item test was used as the pretest and posttest. It was devised by the VTT instructor and the MIA.

For the TQL course, no pretest was administered. The pretest was omitted from the course at the government's direction; no comparisons can be made for this course.

Table 8 lists the pre and post performance measures used in the analysis. A t-test for dependent samples was used to determine if students made significant gains as a result of the instruction, based on the pretest-posttest differences. All t-tests were significant ($p < .001$). Individual t-values are presented in Table 8. The comparison of the pretest and posttest data, combined with percentage of students passing the performance measures leads to the conclusion that the instruction was effective in meeting the learning objectives.

Table 8
Pretest and Posttest Performance Data

[illegible]	Performance Test Measure	Pretest $\bar{X}$(SD) (N)	Posttest $\bar{X}$(SD) (N)	t-value (df)
71L10	Timed Typing	20.48(9.58) (33)	32.42(9.58) (33)	11.41* (32)
	Type a Memorandum (# errors)	7.42(4.81) (33)	1.85(1.54) (33)	6.97* (32)
76Y10	50-item Achievement Test	59.95(16.63) (40)	76.00(11.25) (40)	8.57* (39)
95B10	90-item PT[a]	71.81(10.22) (26)	92.58(10.22) (26)	13.56* (25)
HAZ	20-item PT	47.68(13.53) (111)	78.23(10.95) (111)	21.54* (110)
TQL	20-item PT	No pretest given	82.90(11.01) (48)[b]	NA

*p<.001, one-tailed.
[a]PT = Performance Test
[b]Note: There are 11 missing scores from the Rhode Island site.

Self-Report Data

Since performance measures could not be obtained for each student on each task, self-report data were also gathered. Prior to the beginning of each course (except HazWaste), students were asked to rate whether or not they could perform a task and, in some cases, how proficient they were in performing the task.

With the exception of the task Type a Letter, over 70% of the 71L10 students reported that they had never done any of six tasks, and over 80% reported that they did not know how to perform any of the tasks. Fifty-five percent of the students reported that they had performed the task Type a Letter, and 46% reported that they knew how to perform the task. Student self-report data for 71L10 are presented in Table B1.4 in Appendix E.

Since 100% of the students passed the PT for these six tasks, and since a majority of the students reported that they could not perform five of the six tasks on the self-report pretest, these data support the previous conclusion that the instruction was effective in meeting the stated learning objectives.

Students in 76Y10 and 95B10 were asked to rate their proficiency on some or all of the tasks in the course they were taking (using a 5-point rating scale). Self-report data was collected both before and after the instruction.

Table B1.5 in Appendix E presents the results of the 76Y10 student ratings for seven different tasks. On the pretest, the average student proficiency rating on seven different tasks was 2.5. On the posttest, the average ranking was 4.6. The average mean score of the achievement posttest was 76.00 (the Army requires a minimum score of 70% for passing). The consistency of the students' self-report scores and their ability to perform on the posttest supports the effectiveness of the instruction.

Table B1.6 in Appendix E presents the results of the 95B10 student ratings for 11 different tasks. On the pretest, the average student proficiency rating was 2.0 over the 11 tasks. On the posttest, the average rating was 4.7. The mean score on the posttest was 92.58. Again, the consistency between students' self-reported proficiency and their ability to actually perform on the selected pretest tasks appears to support the effectiveness of the instruction.

Table B1.7 in Appendix E presents the results of the TQL student ratings for four different objectives. Student ratings were the only data obtained as a pretest measure. Students rated their knowledge of the various TQL concepts on the pretest from 1.1 to 2.3 on the 5-point scale. The mean score on the posttest was 82.9, thereby supporting the effectiveness of the VTT training.

Students in the MOS courses were also asked three additional questions at the end of the course concerning the adequacy of the training they received in the skills required to perform the MOS. The first question asked students to rate the quality of the VTT instruction for training the skills in the MOS. The students used a 5-point scale ranging from *excellent* to *poor* to rate

the courses. The second question asked students whether or not they encountered any problems completing the PTs. Students responded either *yes* or *no*. The final question asked students whether or not they encountered any problems passing the PTs. Students responded either *yes* or *no*. These data are presented in Table 9.

Table 9
Student Ratings of Adequacy of Training for the MOS Courses

Quality of VTT for Training MOS Skills

Course	$\bar{X}$	(SD)	(N)
71L10	3.31	(1.06)	(32)
76Y10	3.50	(1.04)	(40)
95B10	3.15	(0.92)	(26)

Problems Encountered Completing the PTS

Course	% of No Responses (N)
71L10	65.6 (32)
76Y10	60.0 (40)
95B10	84.6 (26)

Problems Encountered Passing the PTs

Course	% of No Responses (N)
71L10	27.3 (33)
76Y10	87.5 (35)
95B10	76.9 (20)

The data indicate that the students in the three MOS courses thought that the VTT instruction was slightly better than *good* (3.0) in teaching the required skills, as indicted by their ratings of 3.31 (71L10), 3.50 (76Y10), and 3.15 (95B10). In addition, at least 60% of the students in each course responded that they had no problems completing the PTs. When asked if they had any problems passing the PTs, only the 71L10 students responded that they had some problems. However, student comments from the narrative data indicate that the problems were not related to poor instruction. The three most common problems students gave were: (a) mistakes in the PTs, such a typing errors, (b) time constraints (i.e, there was not enough time allotted to complete the PTs), and (c) there was a mismatch between the PTs and PEs. These problems were beyond the control of the FTP because the PTs and PEs were obtained from the 71L10 proponent ar ' were used as directed in the RC^3 courseware.

In summary, both the quantitative and narrative data support the effectiveness of the VTT instruction. All MOS students passed all of the PTs; the average posttest scores for the HazWaste and TQL students was 78% and 93% respectively.

Objective B2
Compare the Training Effectiveness of the VTT Courses to Standard Military Courses Taught by Conventional Means

A staple of educational media research is to compare one medium to another medium or to compare one medium to "traditional" instruction. These studies, called comparative effectiveness studies (CES), typically compare the relative achievement of groups of students who have received similar subject matter from different media or from traditional instruction (Clark, 1983, 1989; Wilkinson, 1980).

Some researchers view CES negatively as there are too many differences in the definitions of traditional instruction and media. The concepts are therefore too inexact to be experimentally valid. The trend in CES is a finding of "no significant differences" between traditional instruction and new media.

Rather than conducting additional comparative effectiveness studies, researchers such as Clark (1983) and Wilkinson (1980) have suggested comparing the effectiveness of instructional methods and the cost of delivery systems. For example, the inclusion of instructional methods that add structure, shorter steps, reduce verbal loads, allow self-pacing, provide cueing and prompting, and repeated exposures to content, etc., is often provided in newer media and is the result of more instructional design and development. Presumably, however, any courseware (including traditional instruction) could benefit greatly if effort went into the design and development of the course.

Only Go/No Go data were available from the proponent schools and this would not allow a valid comparison to be made between VTT and traditional instruction. Therefore, instead of comparing the achievement of students in traditional versus VTT instruction, a rough comparison has been made between the instructional methods and time frames used in each VTT course and its traditional counterpart.

Comparison of Instructional Methods

The comparison of instructional methods for the Army MOS courses (71L10, 76Y10 and 95B10) was made between the two traditional alternatives normally available to the training population. Currently, RC personnel may become qualified in a new MOS by attending a resident course at the proponent school or attending a one or two-phased RC^3 taught at a local USARF school. The RC^3 versions typically cover the same technical topics as the proponent school resident course, but they spend less time on each topic because RC personnel have more Army experience. Many RC personnel have already performed some duties that will be required in their new MOS.

The approach taken here was to provide a general conceptual analysis of the instructional methods used in the various alternatives. Several general instructional areas were chosen for comparison in each course because it was impractical to compare the courses completely.

In 71L10, the RC^3 course is a single phased course that may be taught in either the ADT or IDT mode. The 71L10 VTT course is an adaptation of this single phased RC^3 course. The 76Y10 and 95B10 courses are dual-phased courses that require students to complete several weeks of IDT training before taking the two week ADT phase. The 76Y10 and 95B10 VTT courses are adaptations of the IDT phase of the 76Y10 and 95B10 RC^3 POIs and therefore, they are very similar to them in instructional topics and time allocations. Because of these similarities, these VTT courses are being compared to only the IDT phases of the RC^3 materials.

71L10 Administrative Specialist

Besides comparing the instructional methods used in the 71L10 RC^3 course, the 71L10 VTT course was also compared to the methods used in the resident AC school. The information for this comparison was obtained through a telephone interview with Mr. W. Ripperger at the Soldier Support Center, Ft Benjamin Harrison, Indiana on September 20, 1993. Ten general instructional areas were chosen for comparison (Table 10).

Table 10
MOS 71L10
Comparison of Alternatives

Basis of Comparison	VTT Course	RC^3 Course	AC Resident
Total Course Length*	2 Weeks	10 Days (ADT) 20 Days (IDT)	6 Weeks
Computer Assisted Hours	0	0	32
Typing Hours	26	26**	80
Practical Exercise Hours	10	39	137***
Exam Hours	10	15	26
Field Training Exercise Hours	0	0	40
Lecture Hours	26	26	1
Number of Graphics/Transparencies	1200	0	30-35
Color Media	Yes	No	No
Total Video Minutes	14.5	0	0

*Amount of time required to complete the instruction.
**Includes .5 hours of lecture, 20.5 hours of practical exercise and 5 hours of exam.
***Includes 80 hours of typing.

A unique aspect of the resident proponent school course is that it has a three-to-five day (40 training hours) field training exercise (FTX) during which the students practice MOS specific and common soldier tasks in a field (i.e., non-cl[illegible]om) environment. The FTX has been omitted in the RC^3 and VTT versions of the cou[illegible] reduce training time. This design also allows the course to be taught in a single classroo[illegible]ase.

Another significant difference between the resident course and the VTT and RC^3 alternatives is that the resident course contains 36 hours of computer-assisted instruction (CAI) using a standard word processing program. In fact, every student at the AC resident school uses a computer for word processing throughout the classroom portion of the course. In both the RC^3 and VTT versions of the course, the students typically use electric typewriters to practice keyboarding skills; this does not give them practice with word processing programs.

While the proponent school resident course uses some overhead transparencies (approximately three to five per task), the instructors rely heavily on the use of the chalkboard and print materials. The proponent school also has some motion media available, but it is seldom used. According to Mr. W. Ripperger, the instructors at the proponent school tend to use a very personal and interactive approach to delivering the instruction. This approach may include question and answer sessions, drills designed to improve the student's ability to locate specific information contained in Army regulations, and typing drills. The CAI portions of the course also contain some computer generated exercises in addition to instructor led keyboarding drill and practice.

76Y10 Unit Supply Specialist

Table 11 presents seven instructional areas that were chosen for comparison of the 76Y10 courses. Unlike the 71L10 AC resident course, the 76Y10 RC^3 and AC resident courses do not include a FTX, CAI, or typing practice. Lecture and demonstration hours were grouped together because these two groups were listed under the umbrella of "VTT instruction" in the VTT POI, rather than separately as they were for the RC^3 and resident courses. The information for the RC^3 and AC resident courses was obtained through a telephone interview with Mr. G. Lamar at the Quartermaster Center and School, Ft Lee Virginia, on September 28, 1993.

Table 11
MOS 76Y10
Comparison of Alternatives

[illegible]	[illegible]	[illegible] Course	AC [illegible]
Course Length**	10 Days	28 Days	49 Days
Practical Exercise Hours	18	20.5	129.5
Exam Hours	15	13	17
Lecture/Demonstration Hours	58	67.5	126
Number of Graphics/Transparencies	1180	109	200-300
Color Media	Yes	No	Yes
Total Video Minutes	10	0	6-8

*IDT phase only
**Amount of time required to complete the instruction

An obvious difference between the VTT, RC^3, and proponent school AC resident courses is the total length of each course. The proponent school resident course covers more material and successful completion of the course results in the award of the MOS. The VTT course and RC^3 IDT phase cover only the part of the instruction needed to perform the combat critical tasks related to the MOS. The ADT portion of the RC^3 course was not included in the VTT course due to psychomotor skills content, weapons security issues, and the military nature of the content.

The six to eight minutes of video shown in the proponent school AC resident course is not officially part of the POI. It is instruction that is required to be shown in the Basic Non-Commissioned Officer Course (BNCOC) and Advanced Non-commissioned Officer Course (ANCOC). The videos shown in the 76Y10 AC resident course are for information and future reference only. These videos were not shown in the VTT course because they were not included in the RC^3 materials that were used in the development of the VTT course. The videos used in the 76Y10 VTT course were specially produced for the course by the FTP and relate directly to the topics covered by the instruction.

95B10 Basic Military Police

Ten instructional areas were compared for the 95B10 courses. The proponent school AC resident course also includes a 47-hour FTX to provide tactical training and to allow students to practice tactical skills in the field. The information for the RC^3 and AC resident courses was obtained through a telephone interview with Mr. P. Kelly at Military Police School, Ft McClellan, Alabama on August 30, 1993. Like 76Y10, the most obvious difference is the length of time needed to complete the courses and the differences in the amount of time spent on lecture/demonstration, PEs, and examinations (Table 12).

Table 12
MOS 95B10
Comparison of Alternatives

[illegible]	[illegible]	[illegible]*	[illegible]
Total Course Length**	10 Days	11 Days	70 Days
Demonstration Hours	3	3	18.1
Case Study Hours	0	0	2
Practical Exercise Hours	20.9	18.6	180.6
Examination Hours	17.75	19	47.6
Field Training Exercise Hours	0	0	47
Lecture Hours	38.42	46.4	98.7
Number of Graphics, Slides/Transparencies	880	773	500
Color Media	Yes	Yes	Yes
Total Video Minutes	28	0	160

*IDT phase only
**Amount of time required to complete the instruction

The proponent school AC resident course uses a mix of still visual media consisting of color 35mm slides and overhead transparencies. This combination consists of approximately 250 overhead transparencies and 250 35mm slides. These 35mm slides are also used in the RC^3 and some were used in the VTT materials. For the VTT course, the 35mm slides were digitized and converted to computer graphics files for use with the multimedia computer. Not all the 35mm slides were suitable for use with the TNET equipment. The slides were supplemented by other graphic media.

The proponent school AC resident course uses interactive strategies that are designed to increase student participation in the class lectures. Instructors are trained to focus on students who do not appear to be involved in the instruction. In addition, the proponent school resident course contains many physical demonstrations that require student participation. The 180 hours of PEs in the proponent school AC resident course include psychomotor activities that were not included in the RC^3 materials and therefore were not adapted to VTT.

Hazardous Waste Handling, Activity Level

The HazWaste course delivered by the FTP was an adaptation of a 32-hour course developed by the Navy Environmental Engineering Support Activity (NEESA). The information for this comparison came from an interview with Ms. U. Shaw, Naval Air Station, Cecil Field, Jacksonville, Florida on October 13, 1993.

The NEESA course is normally used to train HazWaste coordinators in and above the grade of E7. Students in the 32-hour NEESA course are evaluated on a pass/fail basis and successful completion of the course results in certification as a HazWaste coordinator.

The VTT HazWaste course combined elements of the 32-hour NEESA coordinators course with safety considerations. It was designed as an overview for all HazWaste handlers and resulted in no official military certification. An eight hour platform delivered course, similar to the VTT course, has been planned by the Navy but has not been developed.

Seven instructional areas were chosen for comparison. Besides the 21 hour difference in total course length, the major differences were the number of hours for exams and practical exercises (Table 13).

Table 13
HAZWASTE
Comparison of Alternatives

Basis of Comparison	VTT Course	NEESA Course
Course Length	8 Hours	32 Hours
Practical Exercise Hours	.58	10
Exam Hours*	0	10
Lecture/Demonstration Hours	8.5 Hours	10.5-10.75
Number of Graphics/Transparencies	150-200	205
Color Media	Yes	Yes
Total Video Minutes	15-20	75-90

*Examination given for project evaluation purposes only

The NEESA course instructors use group participation exercises that relate the course content to practical, on-the-job-experiences to stimulate interaction among the students. The instructors also use volunteer students to demonstrate the wearing of protective clothing. Guest demonstrators from the fire department are used to demonstrate "encapsulated clothing" (clothing designed to more completely protect the wearer from extremely hazardous substances). Encapsulated clothing was demonstrated in the VTT course by use of a videotape presented over the TNET system.

Total Quality Leadership

The VTT TQL course was an adaptation of the Navy's one-day Introduction to TQL course. Six instructional areas were chosen for comparison. The information for this comparison was obtained from Master Chief R. Kline at Little Creek Amphibious Base, Norfolk, Virginia on October 5, 1993, and is shown in Table 14.

Table 14
TQL
Comparison of Alternatives

[illegible] Comparisons	VTT Course	Standard Course
Total Hours of Instruction	6	7
Simulation Exercise Hours	1.75	1.5
Total Number of Simulation Exercises	1	2
Lecture Hours	3.75	4.25
Number of Graphics/Transparencies	108	50-100
Color Media	Yes	No*

*Some instructors in the field have colorized the proponent school transparencies

An interesting difference between the two courses is the number of simulation exercises used in each course. The standard Navy course contains two exercises, "Life in the Red Bead Factory" and "Broken Squares." The VTT course only contained the "Life in the Red Bead Factory." Both exercises emphasize team building and the importance of group effort. The "Broken Squares" exercise also illustrates the uses of non-verbal communication and is followed by an AAR where the students discuss lessons learned from the exercise.

Although the VTT course had one less simulation exercise, it devoted 15 minutes more to this one activity than the standard course devoted to two activities. The "Broken Squares" exercise was omitted from the VTT course to compensate for the extra time added to the instruction by the network interaction protocols.

A side note to the "Life in the Red Bead Factory" exercise was the role of the MIA in the VTT version of the course versus the role of the military instructor in the standard Navy course. In the standard course, the military instructor is physically present with the students and acts as a foreman in the factory. In the VTT version, the MIA is at the origination site and acts as the corporate Chief Executive Officer (CEO). The role of the factory foreman must be played by the IC at the site. This required additional training in order for the IC to adequately perform this function.

To summarize this objective, it was impossible to compare the training effectiveness of different versions of the same course. Presumably all versions are effective, but the courses themselves and the instructional methods were too different to accurately compare. A brief comparison of the different training options of the five courses was provided. Typically, the VTT courses used more varied media and were usually shorter in length.

Objective B3
Identify Effective Instructional Methods and Strategies for VTT Courses

The purpose of this objective was to ascertain which of the instructional methods and strategies used during VTT were effective. A review of literature on distance learning and teletraining was conducted to determine which instructional methods and strategies were suggested for use during VTT (Martin, 1993). The methods and strategies that were most important for incorporation into VTT courseware were:

- involvement and motivational activities
- interaction with the instructor, other students, and the instructional materials
- feedback
- advance organizers
- group and individual activities
- opportunities for students to ask questions
- a student study guide
- off-line activities
- a multimedia approach, including the use of graphics, other visuals, and video.

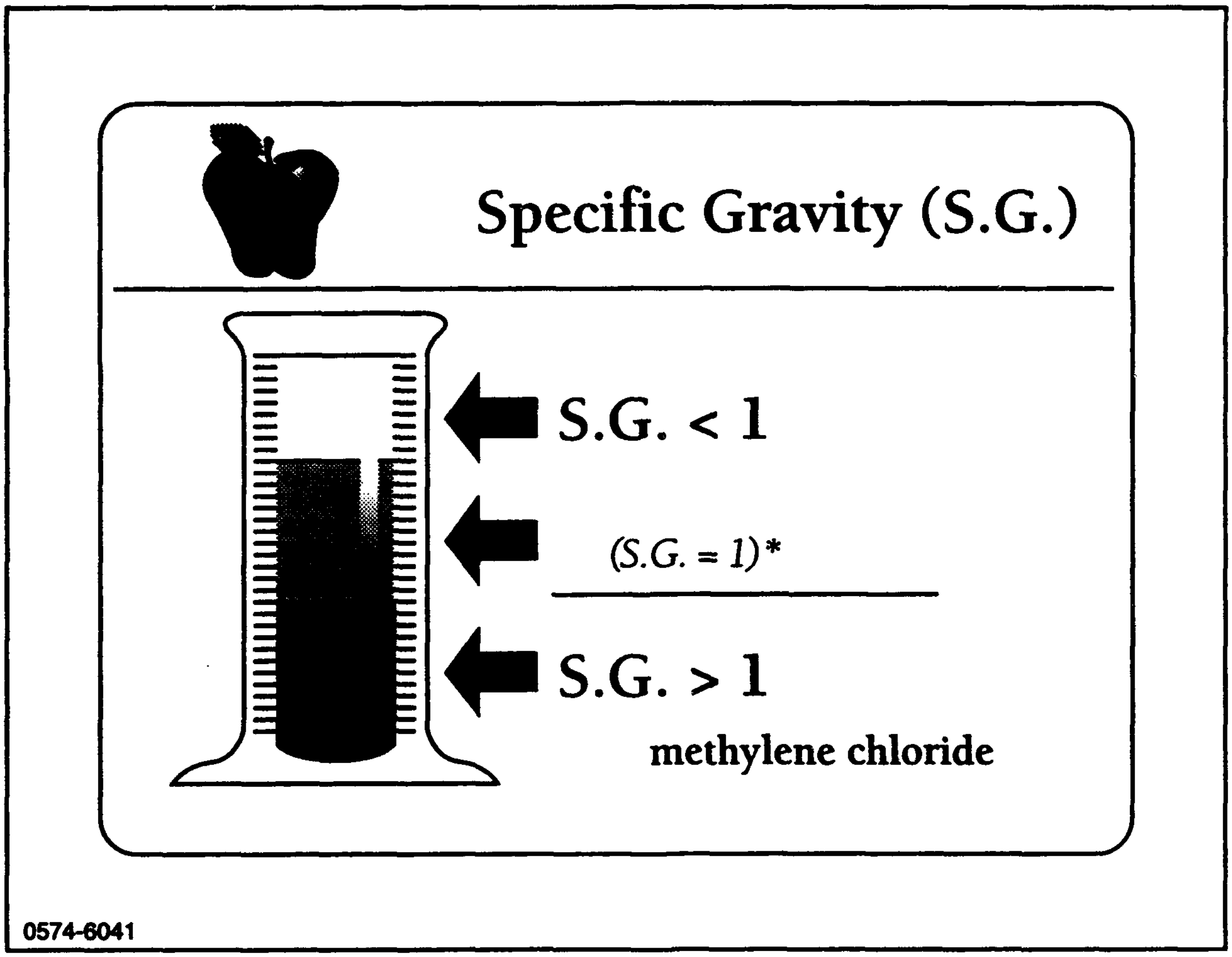
During the design, development, and production phases of the FTP, the course developers used principles of instructional systems design (ISD), specifically the conditions of learning and the events of instruction (Gagne, 1985; Gagne, Briggs, & Wager, 1989). The suggested VTT methods and strategies were integrated with the principles of ISD and incorporated into the instruction. Specific examples of how these methods were included in the VTT courses are:

- Instructional games were developed to promote involvement, motivation, and interaction.
- PEs were used to provide practice, feedback, and remediation, and they were designed as individual and group on-line and off-line activities.
- Question and answer sessions were preplanned and included in the instruction to provide practice, feedback, interaction, and remediation.

- Advance organizers were included to provide an overview and context for: (a) the course (in part by presenting the goals and objectives of the course), (b) for each lesson, and (c) for each videotape presentation.

- A student study guide, called the Interactive Study Guide (ISG), was designed to promote interaction with the instructional materials and to focus the student's attention on important ideas and concepts that should be learned and remembered.

- Word pictures (Cyrs & Smith, 1990) were incorporated into each ISG. Word pictures are graphic representations of the content with key words omitted (Figure 14). Students wrote in the important points in the ISG as the instruction progressed.



* student fills in word as shown on the screen graphics

Figure 14. Example of a Word Picture

- Graphics were used extensively in all the courses to support the instruction, focus attention, and provide motivation.

- Multimedia, including videotapes and the use of the ELMO, was used as needed to explain important concepts, ideas, and procedures, to clarify content, to provide *practice* and feedback activities, and to stimulate attention and motivation.

Data from Students

Students were asked to rate on a 5-point scale: (a) the effectiveness of instructional methods that were used in the courses, (b) the amount of interactivity provided, and (c) other course characteristics that would provide input into the effectiveness of the VTT courses.

Instructional Methods. Figure 15 and Table B3.1 (in Appendix F) present the student ratings of instructional methods. Students in the three MOS courses rated the word pictures and graphics between *moderately helpful* and *helpful* (3.65, 71L10; 3.82, 76Y10; 3.44, 95B10) whereas students in the special topics courses rated the graphics and word pictures between *helpful* and *very helpful* (4.33, HazWaste; 4.43, TQL). In the MOS classes, over 75% of the students rated word pictures and graphics 3.0 or higher (*moderately helpful* or better); in the special topics classes, over 95% of the students rated the use of word pictures and graphics *moderately helpful* or better.

With the exception of 76Y10, all students rated the value of the PEs as *helpful* (over 4.0). While the 76Y10 students ranked the PEs as *moderately helpful* (3.44), over 90% of the students in all of the classes including 76Y10 rated the PEs as 3.0 or above. Based on their narrative responses, some of the comments students made about the 76Y10 proponent school supplied practical exercises were that they were difficult to read because of poor reproduction quality, they contained both content and typographical errors, and they were too long.

Students in the MOS courses were also asked about the effectiveness of the instructional games and the remediation activities used in the courses. The instructional games were rated between *moderately helpful* and *helpful* (3.44, 76Y10; 3.46, 95B10), with the 71L10 students rating games lower (2.61) than the other two classes. Remediation activities were also rated *helpful* by the 71L10 and 95B10 students (4.13, 4.05), with 76Y10 students rating these activities lower (3.68) than the other two groups.

Special instructional methods were used in each of the MOS classes as required by the POIs. These are listed in Table B3.1 and were rated *helpful* (4.39, 71L10; 3.82, 76Y10; 4.60, 95B10) by the students.

Interactivity. One of the key principles required for effective VTT *instruction is that* students must have opportunities to ask questions and to interact with each other and instructional personnel at the origination and their site.

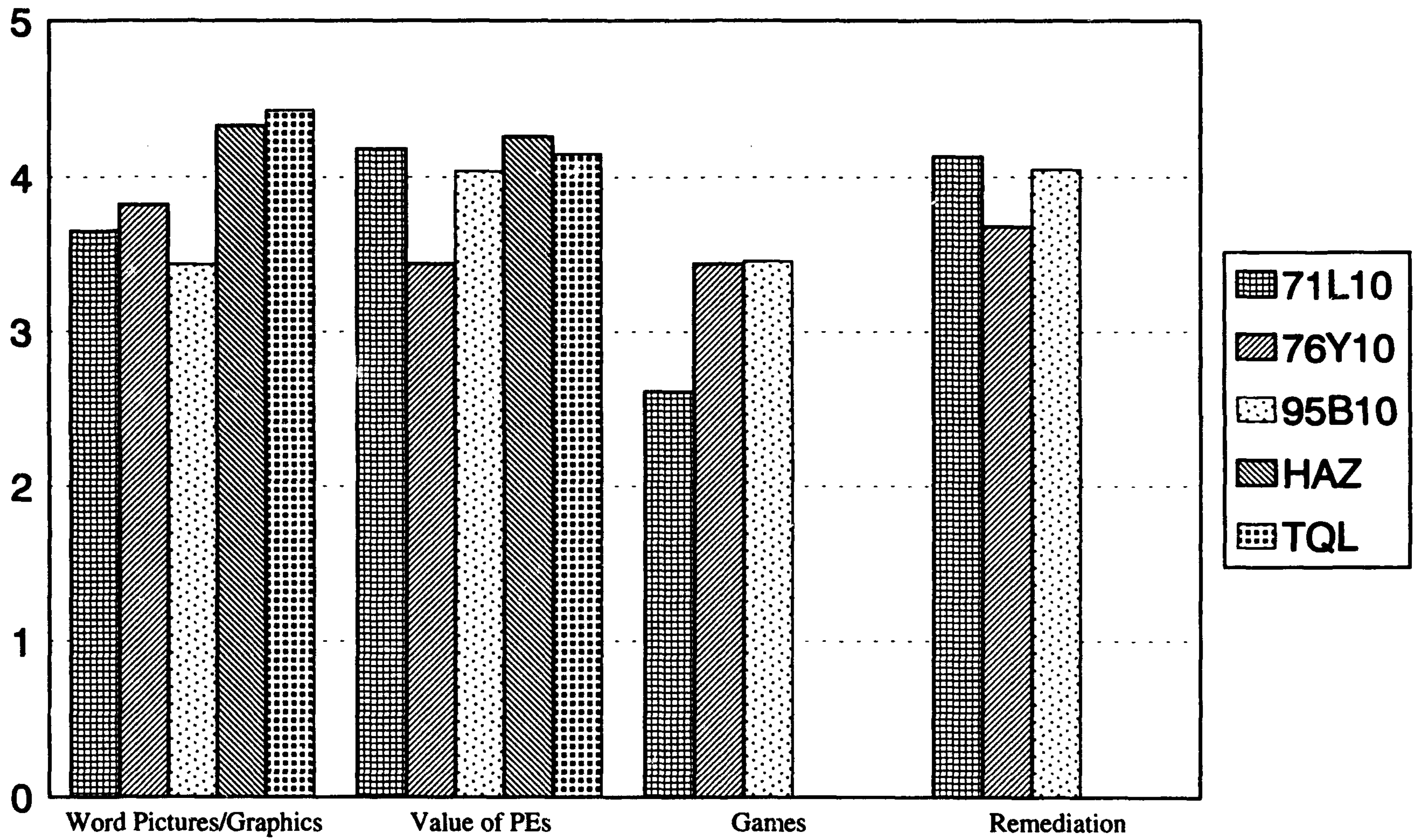


Figure 15. Student Ratings of Instructional Methods

Students were asked to rate seven different types of interactivity:

- *opportunities to ask questions*
- *opportunities to ask follow-up questions*
- *interaction with students on-site*
- *interaction with students on the network*
- *interaction with the VTT instructor*
- *interaction with the instructional coordinator (IC)*
- *interaction with the military site coordinator (MSC)*

Table B3.2 in Appendix F gives the means, standard deviations, percentage of students rating the interactivity of the course as 3.0 or higher on a 5-point scale, and the sample size for each of the five courses. Figure 16 graphically presents the means for representative types of interactivity.

Of the 29 categories regarding interactivity, 24 were rated at 4.0 or above, indicating that the students felt the opportunities to ask questions and to interact with others during instruction was *very good* or *helpful*. Of the five rating below 4.0, three of them were on the question *interaction with students on the network*. Students in the three MOS courses rated this type of interactivity as 3.38 (71L10), 3.50 (76Y10), and 3.08 (95B10). Students in the special topics courses were not asked this question. A review of students' responses from the narrative data from the three MOS courses revealed that the students at the FCCJ2 site felt more isolated than did the students at the other sites. These data also revealed that the students at SPJC and VCC had more negative perceptions about the students at FCCJ2 than they did of other students taking the courses. These perceptions may have influenced the students' rating of the network interactions, but it is unclear why the students at FCCJ2 felt more isolated and why the other sites perceived the FCCJ2 students more negatively.

There were two other ratings of interactivity that were below 4.0. The 95B10 students rated *interaction with the VTT instructor* at 3.60; the 76Y10 students rated *interaction with the instructional coordinator* at 3.92.

Taken as a whole, these data about interactivity indicate that the students felt that the opportunities they had for asking questions and interacting with others during the VTT instruction were sufficient in number and that they were instructionally useful.

Other Course Characteristics. Students were also asked to rate the quality and effectiveness of other aspects of the courses: the lesson presentations, course organization,

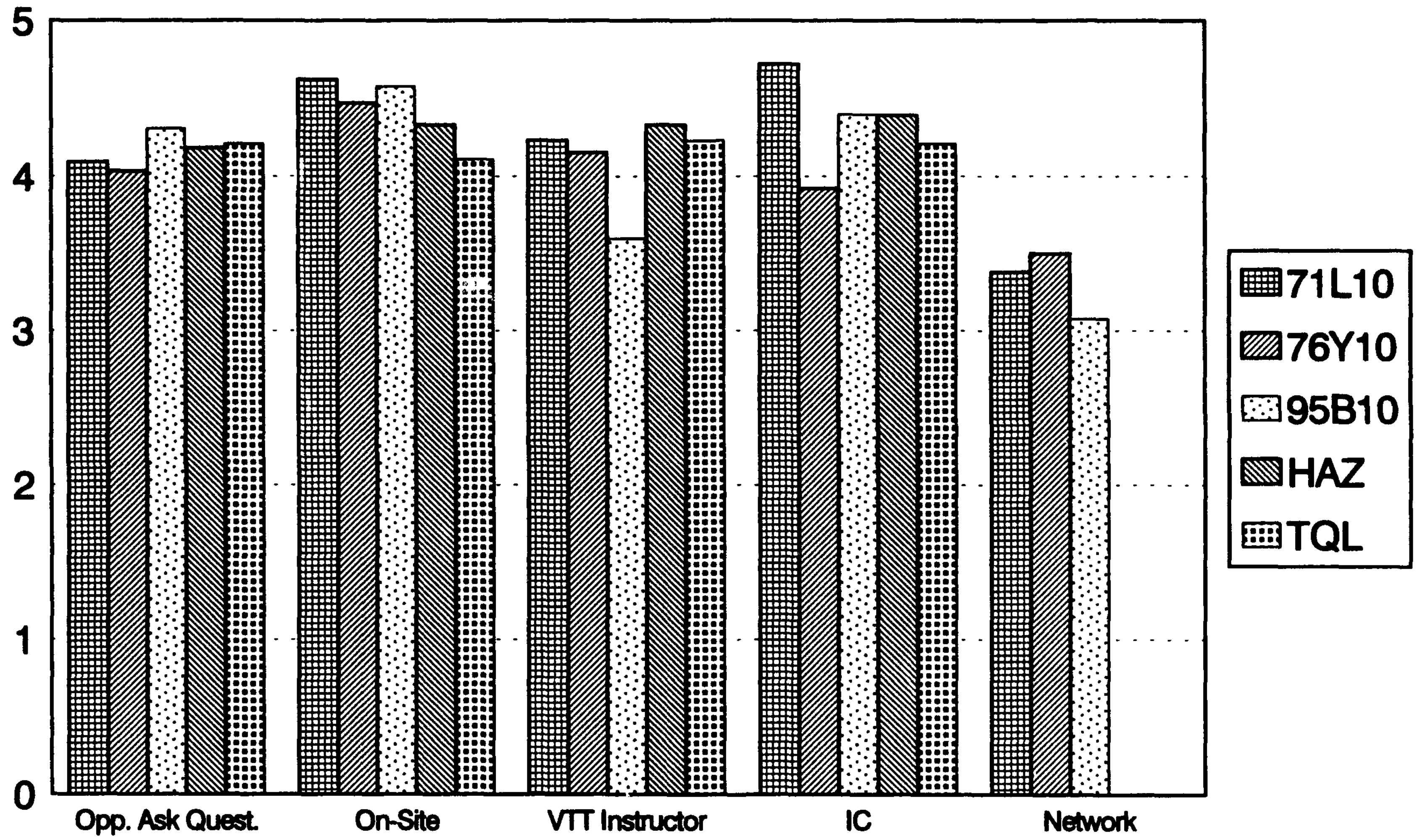


Figure 16. Student Ratings of Interactivity

printed materials, time allotted to cover the topics, the pacing of the course, the introduction to VTT and TNET, and the overall quality of the course. Table B3.3 in Appendix F gives the means, standard deviations, percentage of students rating the characteristics of the course as 3.0 or higher on a 5-point scale, and the sample size for each of the five courses. Figure 17 graphically presents the means of representative course characteristics.

In general, the characteristics *Introduction to VTT* and *Introduction to TNET equipment* were rated slightly higher than the other characteristics with all the scores around 4.0 except for 76Y10. The 76Y10 students rated *Introduction to TNET equipment* somewhat lower at 3.55.

Ratings for the other course characteristics for HazWaste and TQL are generally higher than for the MOS courses except for the characteristic *Time to cover the topics.* While the ratings for *Time to cover the topics* were slightly above average for the special topics courses (3.24 and 3.13, respectively), it is possible that the students felt that there was a great deal of content to be covered in a short amount of time since these courses were presented in one day. Students in 71L10 rated *Time to cover the topics* at 2.69, indicating that they too thought the course may not have been long enough to adequately cover the content.

When asked to rate other characteristics of the course: *quality of lesson presentations, general course organization, quality of printed materials, and overall quality of the courses,* the HazWaste and TQL students tended to rate those characteristics higher than did the MOS students. The student ratings from the MOS courses ranged from 3.19 to 3.88; for the special topics courses, the ratings ranged from 3.84 to 4.19.

Students were asked about the *pacing of the course* they were taking. A response of 3.0 meant that the pacing was *about right*; higher numbers meant the class was *too fast*, lower numbers meant the class was *too slow.* Students in 95B10 felt that the instruction was a little *too slow* (2.04); students in 71L10 felt that the course was a little *too fast* (3.48). Students in 76Y10, HazWaste, and TQL rated the pacing of the course as 2.68, 2.94, 3.11 respectively, or *about right.*

Students were also asked whether or not the goals and objectives of the course were made clear to them. Eighty-five percent of the students in 76Y10 said that the goals and objectives were made clear to them as did 93.9% of 71L10 students, 96.2% of 95B10 students, 99.1% of HazWaste students, and 100% of the TQL students. These data indicate that the students were provided an adequate advance organizer to the course by explanation of the course goals and objectives.

Data from Instructional Coordinators

The ICs for the three MOS courses were asked to rate the quality of the instructional methods, interactivity, and other course characteristics at the end of each instructional day. The ICs rated five aspects of the course (Table B3.4 in the Appendix F). These data are higher than the students' ratings. All ratings except three are 4.0 or higher, with the 71L10 course ratings the highest, ranging from 4.67 to 4.87.

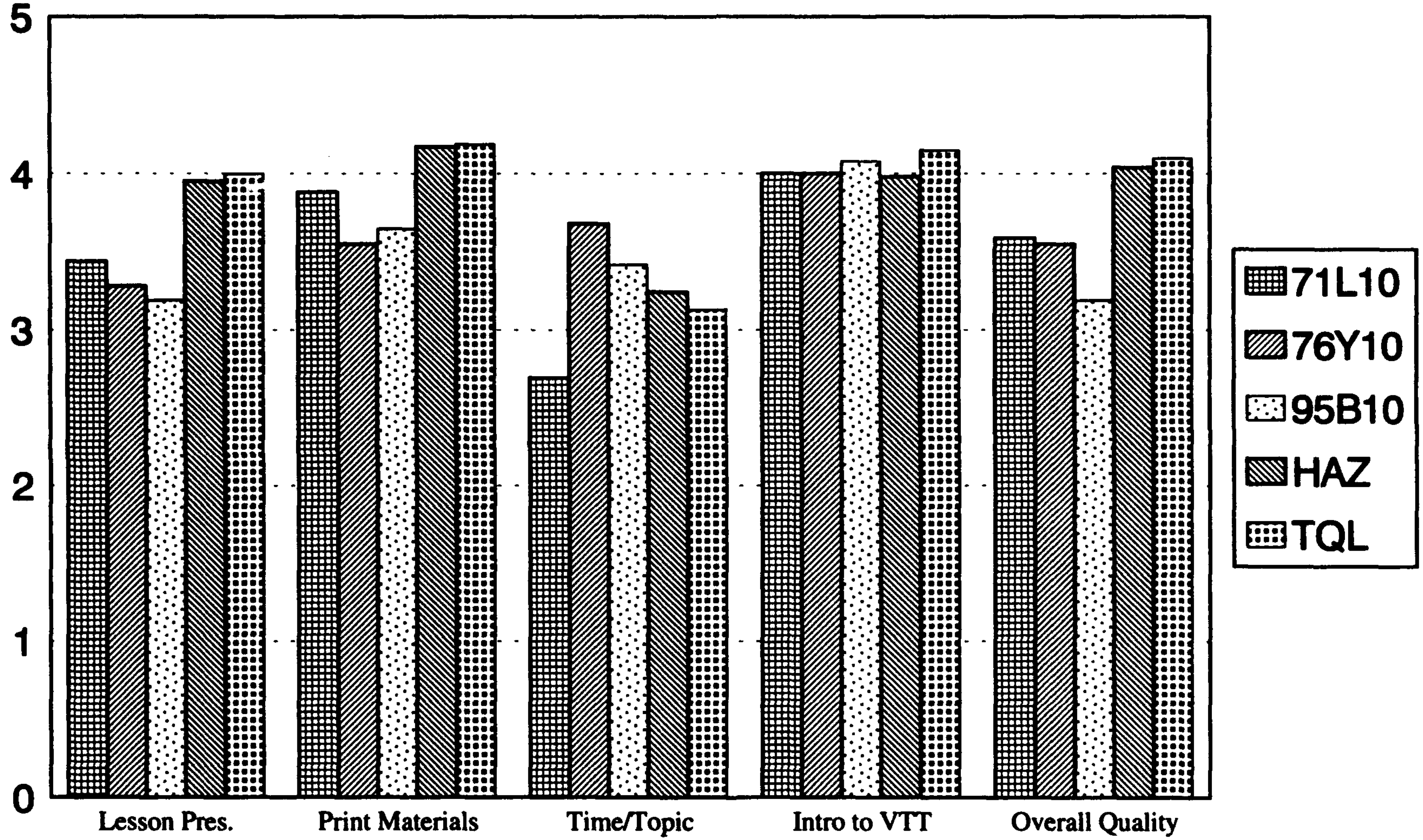


Figure 17. Student Ratings of Course Characteristics

The two lowest ratings were given for the VTT instructor's *wise use of available time* for 76Y10 and 95B10. The ratings were 3.93 and 3.69 respectively. The only other rating below 4.0 was 3.98 (*Instructor Use of Graphics and Charts* -- 76Y10).

These ratings from the ICs indicate that they thought the MOS courses were of high quality.

Data from VTT Instructors and MIAs

The VTT instructors and the MIAs were interviewed at the end of the course they were teaching. Each VTT instructor and MIA was asked to discuss: (a) successful and unsuccessful instructional activities and (b) their attempt to promote interactivity and whether or not they felt the amount of interaction was sufficient. There were a total of eleven responses.

In response to which strategies were particularly successful, the VTT instructors' and MIAs' responses fell into two main categories: (a) the multimedia possibilities, particularly the graphics and word pictures, but also the video vignettes, photographs, slides, and the use of the ELMO, and (b) the supplementary exercises (e.g., PEs, case studies, and question and answer sessions) that "broke up the instruction" and "provide[d] time for hands-on practice." When asked which strategies were not successful, the most common response was that all the strategies "were successful to some extent."

The VTT instructors and MIAs were also asked to explain how interactivity was promoted during the VTT instruction. In all the cases, the instructors stated that the question and answer sessions that were preplanned and the activities that promoted discussion (e.g., instructional games, contests, and short exercises, including PEs) were the most beneficial in stimulating interaction. When the instructors were asked to discuss whether the amount of interaction in the course was sufficient, they all said that it was sufficient, but that it could always be improved. The most common suggestions for improvement were to: (a) make the interactive activities and strategies more novel and creative, and (b) to increase the opportunities for students to ask questions.

In summary, the instructional methods and activities designed into the VTT courses were rated by students and instructional personnel as effective. While improvement is always possible, the activities designed to promote interaction were the most highly rated. Since these activities were preplanned, this supports the contention that well designed courses influence student learning.

Objective B4
Determine the Degree of Student Motivation and Interest in the VTT Instruction

No specific motivational scales or instruments were administered to students to determine their degree of motivation for the course. However, student motivation and interest can be inferred from data collected from the students, instructors, ICs, and MIAs.

Data from Students

As discussed previously, research has determined that interaction is a critical part of a distance education course. To increase student motivation and learning, as much interaction as possible should be provided between the instructor and students, among the students, and between the students and instructional materials (Ritchie & Newby, 1989; Stoffel, 1987). Objective B3 indicated that the majority of students rated the interactivity in the VTT courses as 4.0 or better on a 5.0 scale. Thus, this level of interaction should lead to high levels of motivation.

The students' perceptions of the quality of the instruction is also an indicator of student motivation. Students were asked what they liked most and liked least about this form of instruction. Upon analyzing the narrative data, evaluators identified several categories that encompassed the student responses. For example, students commented about the instructor, the community college atmosphere, the technology, course material, travel, or some other topics. Two hundred and two respondents offered 222 positive statements regarding the courses, while 165 students made 138 negative statements. The large number of positive responses indicate that students viewed VTT courses favorably. Results are reported in Table 15.

Table 15
Student Ratings: Positive and Negative Statements Regarding VTT Courses

	71L10	76Y10	95B10	HAZ	TQL	Overall
No. Positive State-ments (N)	49 (31)	37 (36)	22 (22)	69 (68)	45 (45)	222 (202)
No. Negative State-ments (N)	32 (30)	32 (35)	20 (21)	49 (42)	5 (37)	138 (165)

Students were also asked to compare this form of instruction to other types of military training using a 5-point scale. Sixty-one percent of the respondents rated the VTT training *better than* or *superior* to other military instruction.

In addition, students were asked to pick from a list of military training options the type of training they would prefer in the future. Results indicate that 71% of the respondents ranked *VTT at a community college* the most or second-most preferred form of military instruction. As reported in Objective A2, and illustrated in Figure 7, instruction via *VTT at a community college* had the highest mean of any other method of instruction. This finding indicates that students were pleased with this method of instruction, which is a favorable indicator of interest and motivation.

Finally, students were asked to rate on a 5-point scale their attitudes toward taking another military teletraining course. Results were presented in Figure 11 in Objective A2. Student ratings ranged from a mean of 3.78 in the 71L10 course to 4.54 in the TQL course. In general, 64% expressed a *very favorable* response while 15% had a *favorable* response.

In summary, while no motivational data was formally collected, the degree of student motivation and interest can be inferred from data collected regarding student perceptions of the instruction and its interactivity, their comparisons of VTT to other options, and whether they would consider taking another VTT course. Students were positive with regard to each of those factors, and thus, it appears that they were very interested and motivated in using VTT.

Objective B5
Determine the Relationships Among Student Entry Characteristics and Student Performance and Perceptions Regarding VTT

The purpose of this objective was to determine whether student entry characteristics were related to VTT student performance and course perceptions. It is useful to know whether scores on the course PTs are correlated with student characteristics such as age, rank, education, aptitude, prior subject area knowledge, and so forth. If they are, then it may be that VTT is not for everyone, or that special provisions are required for certain types of students. It is also useful to know whether student ratings of the VTT approach differ based upon these same background variables. In this case, a useful question is whether certain types of students like the VTT approach better than others. More importantly, do students perform significantly better or worse than students in traditionally taught courses and can these students be determined by these background variables?

The data gathered during the course evaluations offer a number of opportunities to explore these relationships. The number of variables available for the analyses differ between the MOS courses (71L10, 76Y10, and 95B10) and the two special topics courses (HazWaste and TQL) in that more detailed data are available for the former. However, fewer students took the MOS courses, so less precision is afforded for the statistical analyses of the MOS course data.

In addressing this objective, the following relationships were explored:

- Student background characteristics to objective and subjective measures of course proficiency
- Student background characteristics to ratings of course materials and processes
- Student background characteristics to overall course ratings.

Variables Used in the Analysis

Student Background Variables

A number of student background variables were selected for this analysis. Most of the background variables were available from students in all of the MOS courses and many were available from the HazWaste and TQL students. The categories of background variables that were analyzed are described below (variable label in parentheses):

- Date of birth (DOB)
- Grade/Highest grade reached (Grade)
- Primary Military Occupational Specialty and duty position (PMOS)

- Expiration Term of Service date and reenlistment intention (ETS)
- Level of civilian education (Education)
- Reason for taking course, interest in course, and relevancy to military goals (Interest)
- Previous experience with distance courses and technology (DE Experience)
- Leisure activities - reading, television (Leisure)
- Number of related courses taken - HazWaste and TQL (Courses)
- Amount of related prior experience (Experience)
- Armed Services Vocational Aptitude Battery scores - MOS courses only (ASVAB)

Objective and Subjective Measures of Course Performance

Measures of student performance varied by course as described in Objective B1. Pretests and posttests for the MOS courses were taken directly from the course materials, and FTP staff constructed objective tests for HazWaste and TQL. Pre and posttesting were implemented for HazWaste, but not for TQL. Thus, objective posttest scores were available for all of the courses, but gain scores (difference between pretest and posttest scores) could not be calculated for TQL. Subjective measures (self-ratings) of pre and post course proficiency were available only for the three MOS courses.

Ratings of Course Materials and Processes

A number of items from questionnaires administered in each of the courses were selected as measures of student course perceptions. These items consisted of student ratings of course materials and processes. Each question required the students to respond on a 5-point Likert scale. Responses to these items were summed to obtain a composite rating of the perceived quality of the materials and processes used in the courses.

Overall Course Rating

Eight items measured the students' overall ratings of the VTT courses. These were also measured on 5-point Likert scales. Again, responses were summed to obtain an overall course rating for each student.

Methodology

The statistical analyses varied somewhat from course to course because of the differing data sets available. However, the general approach for the analyses was two-fold. First, zero-

order Pearson product-moment correlations were calculated between each of the student background variables and the corresponding outcome measures. This was done to gain a general understanding of the types of relationships between the predictor and criterion variables.

Second, stepwise multiple-regression analyses were performed on the variables within each class of performance measures and ratings to determine the best prediction equation for each case. Variables were entered into the prediction equations based upon their predictive qualities and eliminated only when the associated significance tests for exit failed to reach the standard .05 significance level.

Results

Relationship of student background variables and objective and subjective measures of course performance

The question addressed here was whether the students' performance in the courses was related to the background and skills that they brought to the courses. Pre and post measures of objective proficiency were available for all courses except for TQL, where students only took the posttest. Subjective pre-post self-assessments of proficiency were available only for the MOS courses.

Correlations. Pearson product-moment correlation coefficients were calculated to determine the relationship of each student background variable with proficiency on the performance tests (i.e., posttest and gain scores). To account for the fact that there was a small, but existing level of missing data in each of the analyses, pairwise deletion of cases was used when calculating the correlation coefficients and testing their significance.

Twenty demographic variables were correlated with 14 measures of subjective and objective performance. That is, for each course except 71L10, the 20 demographic variables were correlated with one subjective rating of post-course achievement (MOS courses only) and two performance scores (posttest and gain scores, except for TQL which only had a posttest). For 71L10, there were four performance measures, a posttest and gain score for both typing skill and memorandum writing. The results of the correlational analysis are provided in Table B5.1 in Appendix G.

In general, demographic variables did not correlate with subjective or objective measures of performance. Of the 280 correlations calculated, only 42 (15%) were significant. Considering the number calculated, one may wonder if the significant correlations are real or due to chance factors. One may employ the Bonferroni multi-stage correction to control for potentially spurious findings (Larzelere & Mulaik, 1977). Using this approach, the accepted level of significance (α=.05) is divided by the number of tests conducted (280), resulting in a new significance level equal to .0002. The most significant correlation was p=.001; thus, none of the correlations are significant after correction. However, the reader should note that when large numbers of analyses are employed, the Bonferroni procedure is highly conservative.

Examining the correlations that were found prior to the Bonferroni correction, the general finding is that the variables positively related to perceived achievement and/or to higher proficiency test scores in the MOS courses were: (a) related skills (e.g., computer skills), (b) having attended the associated military training school, and (c) several ASVAB scores. A positive correlation between demographic variables related to knowledge and experience in the course content and subjective ratings of post-course achievement and actual performance would be expected since related experience should yield improved performance.

However, some negative correlations were found (Table B5.1 in Appendix G). For example, current grade was found to be negatively related to both the objective and subjective typing posttests in the 71L10 course. Thus, students of lower rank performed better than those of higher rank, and similarly, self-assessments of post-course achievement for students of lower rank were higher than those of students possessing higher rank. As to why lower ranking students performed better, it is possible that they had more familiarity with the required tasks than higher ranking students. The latter may have been removed from these types of tasks for a longer duration.

Similarly, negative correlations were found in the 76Y10 course (Table B5.1 in Appendix G). Length of time in current PMOS and Relevance of the current PMOS were negatively correlated with both self-assessment of post-course achievement and with actual performance. Relevance of the current duty position was also negatively correlated with the self-assessment of post-course achievement. The reason for these negative correlations may be due to the fact that students were being taught procedures applicable to combat operations, but not the procedures required for their present, peace-time MOS. That is, the students complained that they were learning different procedures in class than they were trained to perform in their daily jobs. Thus, the relevance of, and length of time in, the PMOS or duty position may have adversely affected perceived and actual performance in the course.

Multiple Regression Analyses. Results of the stepwise multiple regression analyses for predicting scores on the proficiency tests from student background variables are included in Table B5.2 located in Appendix G. In these and the other regression analyses reported herein, where missing data problems were encountered, pairwise deletion of cases was used.

While a number of zero-order correlations between student background characteristics and the performance were found (Table B5.1), the size of the correlations was generally modest. Thus, the regression equations contained relatively few variables. The obtained multiple R^2s (proportions of criterion variance explained) were between .13 and .44. Prior training at the relevant military school, related skills (e.g., computer experience), and ASVAB Skilled Technical (ST) score were the primary predictors of objective posttest success in the MOS courses. Proficiency in the HazWaste course was best predicted by holding a related military position, and proficiency in TQL, with its more cerebral content, was best predicted by college experience and prior related military training.

Table B5.3 in Appendix G presents a summary of the regression results for the pretest to posttest gain scores. The multiple R^2s varied from .08 to .67, the highest being that for 76Y10.

Objective performance in the MOS courses was best predicted by prior experience and skills, certain technical skill levels (e.g., computer skills as they relate to typing), aptitude measures such as certain ASVAB scores, and the types of positions currently held. Gain in the HazWaste course was best predicted by previous coursework in environmental science and interest in the course. No pretest data were available for the TQL course, making the corresponding regression analysis impossible in this case.

Results of the stepwise multiple regression analyses for predicting students' perceived proficiency and perceived gain in proficiency are presented in Tables B5.4 and B5.5 in Appendix G. The best predictors of perceived proficiency in the MOS courses were factors such as current duty position or rank, prior college courses, experience with television courses, and one ASVAB score (OF: Operators and Food Handlers). The calculated multiple R^2s ranged from .11 to .71 for the three MOS courses, the highest being that for 95B10.

Self-assessed, pre-post gain in one of the MOS courses was predicted by an ASVAB score while position and previous experience were predictors for another (Table B5.5). For the 95B10 course there were no significant predictors. The two calculated R^2s were .41 for 71L10 and .72 for 76Y10.

Relationship of student background variables and student ratings of course materials and processes

The question addressed in this section was whether students' ratings of course materials and processes were related to the background and skills they brought to the courses. The answer appears to be "no."

Correlations. With the exception of the correlation results for 95B10, few variables were related to the composite rating of course materials and processes (see Table B5.6 in Appendix G). Of the 105 correlations conducted, only six (6%) were significant. As before, if the Bonferonni correction is applied here, none of these correlations are significant. Thus, these results must be interpreted with caution. In 95B10, current position and experience were negatively correlated with the ratings, although age was positively related. Generally, it appears that less MOS experienced students appreciated the course materials and processes more than older, more experienced students. The novelty of the courses may have been more impressive to the less experienced students.

The only other significant correlations were obtained for the ratings of the HazWaste course. Interest in this course and prior experience in TV courses produced small, but significant, positive correlations with the rating of materials and processes.

Multiple Regression Analyses. The summary of regression results for the composite rating of course materials and processes is presented in Table B5.7 in Appendix G. Few strong predictive relationships were found among the background variables for predicting student ratings. The two significant predictors were months in the current PMOS for 95B10 and course interest for the HazWaste course. The R^2s were .49 and .23 for 95B10 and HazWaste, respectively.

Relationship of student background variables and students' overall course ratings

The question to be answered in this section was whether students' overall course ratings were related to the background and skills they brought to the courses. As in the previous section, the answer appears to be "no."

Correlations. Again, few significant correlations were obtained (see Table B5.8 in Appendix G). Of the 105 correlations conducted, only 12 (11%) were significant. If the Bonferonni correction is used, none of these correlations are significant. However, examining these results, the significant correlations were found mostly in the MOS courses. Overall course rating was positively related to several student background characteristics (e.g., months in current PMOS, intent to re-enlist). Negative correlations were observed mainly for the education variables in the 71L10 and 76Y10 courses. Apparently, more education resulted in less favorable overall ratings of these two courses, perhaps because these students were likely to be performing more upper level jobs, and hence, they did not appreciate these tasks, they no longer performed them, or both.

Multiple Regression Analyses. The results of the regression analyses for predicting the overall course ratings from the predictor variables are summarized in Table B5.9 in Appendix G. The best predictors of overall course ratings were months of college, months in PMOS, the perceived utility of the college credit awarded, ASVAB General Mechanical score, and age. R^2s varied from .04 to .52 across the five courses with those for 76Y10 and 95B10 being the highest.

In summary, this objective was assessed using correlation and multiple regression techniques in an attempt to identify student demographic characteristics that predict success in video teletraining courses. Of the 490 correlations computed, only 60 were significant (12%). Due to the potential for spurious significant results because of the large number of correlations, a correction of the standard .05 significance level may be warranted. For example, if a Bonferonni correction is applied, then none of these correlations were significant (note that this procedure is very conservative). Therefore, the results of both correlation and multiple regression analyses indicate that no particular demographic variables predict success in VTT courses differently than those that would be expected to predict success for courses taught traditionally (e.g., related experience, technical skills). Based on these analyses, VTT appears to be appropriate for any military student population.

Objective B6
Determine the Effectiveness of the Teletraining Instructors and Site Coordinators (Community College and Military) in Providing Successful VTT Instruction

Teletraining instructors comprise the core of the TNET instructional team, supported at the delivery site by the MIA and at the remote sites by the IC and the MSC. Evaluating the effectiveness of this team was achieved primarily from the students' perspectives, with additional input from the other members of the team, i.e., the VTT instructor, the IC and the MIA. Most assessments of the team's effectiveness were made by the student about the instructor. Student ratings of effectiveness of the MIA, IC and MSC were not as varied and numerous as those of the VTT instructor.

As in other estimates of instructional effectiveness, some allowance should be made for the novelty of the instructional technology and course design that may have influenced participants' evaluations of instructional team members. Students may have responded positively to an instructor or a course simply because they were impressed or excited by the newness of the instructional system. In this evaluation there was no attempt to control for this effect. Further, conventional classroom instruction does not include the support members required for VTT. The novelty of these team members may have affected participants' responses. In conventional instruction, all roles would be consolidated into that of the instructor.

The technology could have functioned as an obstacle to evaluating the instructor's effectiveness. Students often had a more positive reaction to the IC than to the instructor. This response is perhaps not surprising, since the IC was in the classroom with the student and was able to have more ongoing personal contact. Indeed, the IC was expected to be the instructor's representative in the classroom, providing the student with the personal interaction not available from the instructor through the TNET system. The two-way audio and video offered some student-instructor interaction, but it could not replace the in-class contact found in a conventional classroom setting.

Just as the technology functioned as the path connecting the instructor to the students, it also served as a barrier between the two, making it more difficult for the students to have a personal relationship with the instructor. One way that the instructor overcame this barrier was through the use of humor and other interactive techniques. Narrative accounts suggested that instructors achieving higher scores on measures of effectiveness were those who appeared to be successful in personalizing the instruction despite the technological obstacles placed before them. However, another possibility was that those were better instructors in general and the technology had little impact on their techniques. The evaluation did not attempt to control for or analyze these variables.

Student Ratings of the Instructor

Students were asked to rate a series of activities on a 5-point scale in regard to how much the activities assisted in understanding the content of the course. The results of the student ratings that were assessed in all five courses are provided in Table 16. Means, standard deviations, sample size, and the percent of respondents rating the activity as *Helpful* and *Very*

Helpful (scale items 4 and 5 respectively) are presented. The first activity measured in this series was the interaction with the instructor, with the strongest responses coming from the HazWaste students; 89% of them rated the interaction with the instructor either *Helpful* or *Very Helpful* in understanding the contents of the course.

Table 16
Student Ratings of the VTT Instructor

	71L10	76Y10	95B10	HAZ	TQL
Interaction with Instructor on Network					
$\bar{X}$ (SD) **N**	4.23 (.88) 32	4.15 (1.08) 40	3.60 (1.15) 25	4.33 (.74) 111	4.23 (.73) 47
% Helpful/ Very Helpful	84	70	56	89	87
Instructor's Poise, Personality and Enthusiasm					
$\bar{X}$ (SD) **N**	4.36 (.78) 33	4.70 (.52) 40	3.81 (.90) 26	4.20 (.97) 111	4.60 (.64) 48
% Very Good/ Excellent	88	98	65	81	92
Instructor's Communication Skills					
$\bar{X}$ (SD) **N**	4.30 (.81) 33	4.50 (.93) 40	3.96 (.82) 26	4.20 (.95) 111	4.46 (.87) 8
% Very Good/ Excellent	79	93	73	83	86
Preparation of Instructor to Teach on VTT Network					
$\bar{X}$ (SD) **N**	3.88 (1.08) 33	3.95 (1.15) 38	4.00 (.96) 26	4.15 (.87) 110	4.54 (.77) 48
% Very Good/ Excellent	66	75	76	80	87
Overall Performance of Instructor					
$\bar{X}$ (SD) **N**	4.09 (.88) 33	4.36 (.90) 39	3.81 (1.10) 26	4.12 (.93) 110	4.48 (.83) 48
% Very Good/ Excellent	72	82	66	79	89

Students also rated the instructors in regard to various facets of their teaching skills. One item in this category measured the students' evaluations of the instructor's poise, personality and enthusiasm. The responses ranged from 65% of the students rating the instructor as *very good* or *excellent* in 95B10 to 98% in 76Y10.

The instructor's communication skills were rated next. The 76Y10 instructor received the highest ranking on this variable; 93% of the respondents in that course ranked his communication skills *Very Good* or *Excellent.* Seventy-three percent of the respondents in the 95B10 class ranked the instructor as *Very Good* or *Excellent.*

Regarding the ratings of the instructor's preparation to teach on the VTT network, 87% of the respondents in the TQL course rated the instructor as *Very Good* or *Excellent*, while only 66% of the respondents in the 71L10 course rated the instructor as *Very Good* or *Excellent* on this measure.

The overall assessment of the instructor from the students' perspectives was also rated. The highest rating was given to the TQL instructor, who received a rating of *Very Good* or *Excellent* on this question by 89% of her students. Students in 95B10 rated their instructor with an average of almost 4.0 (*Very Good*) and 66% of the respondents rated him as *Very Good* or *Excellent.*

A number of student ratings were obtained only in the MOS courses. The results of these ratings are provided in Table 17. The students rated the instructor's delivery of information over the network. The next item asked the students to rate the instructor on his or her organization of class sessions. Students were also asked to rate the effort of the instructor to encourage class participation and to rate the instructors' ability to make good use of the time available. With the exception of one rating in the 95B10 course, all ratings were near 4.0 indicating that the students thought their instructors were *very good.*

Finally, a measure of instructor effectiveness was the students' evaluations of the instructors' effective use of the equipment. The students in 76Y10 rated their instructor highest in this regard, with 76% of them gauging him as *Very Good* or *Excellent.* The instructor with the lowest rating had 61% of the student respondents ranking him *Very Good* or *Excellent* in the effective use of the equipment (Table 17).

The narrative data from the students support the findings presented. However, students consistently raised questions about whether the civilians were knowledgeable enough about military content to present the MOS courses.

Table 17
Student Ratings: Additional Factors for MOS Courses

Instructor's Delivery of Information Over Network

	71L10	75H10	95B10
$\bar{X}$ (SD) N	4.03 (.92) 33	4.10 (.90) 40	3.73 (.96) 26
% Very Good/ Excellent	66	78	62

Instructor's Organization of Class Sessions

$\bar{X}$ (SD) N	3.85 (1.06) 33	3.80 (1.04) 40	3.77 (1.03) 26
% Very Good/ Excellent	69	68	69

Instructor Efforts to Encourage Class Participation

$\bar{X}$ (SD) N	4.33 (.89) 33	4.23 (1.04) 38	4.04 (.89) 26
% Very Good/ Excellent	88	81	72

Ability of Instructor to Make Good Use of Time Available

$\bar{X}$ (SD) N	3.82 (1.24) 33	3.82 (1.35) 38	2.92 (1.12) 26
% Very Good/ Excellent	63	66	28

Ability of VTT Instructor to Use Equipment Effectively

$\bar{X}$ (SD) N	4.06 (.75) 33	4.10 (.79) 38	3.77 (.71) 26
% Very Good/ Excellent	75	76	61

Student Ratings of the Military Instructional Assistant (MIA)

Students also rated the performance of the MIA. The role of the MIA was to support the civilian VTT instructor at the delivery site; for example, he or she was to answer instructional questions from the military perspective and substitute for the VTT instructor when appropriate. Therefore, results from this item should be viewed carefully since there was a minimum of contact between students and the MIA. These results are presented in Table 18. At the top of the scale, 85% of the students in both the 71L10 and TQL courses gave their MIA a rating of

Very Good or *Excellent*. Only 57% of the students in the 76Y10 course rated their MIA as *Very Good* or *Excellent*, though the mean response was 3.64.

Table 18
Student Ratings: Overall Performance of the MIA

	71L10	76Y10	95B10	HAZ	TQL
$\bar{X}$ (SD) N	4.25 (.72) 32	3.64 (1.20) 39	3.96 (.73) 25	3.96 (1.03) 103	4.31 (.74) 48
% Very Good/ Excellent	85	57	71	76	85

Student Ratings of the Instructional Coordinator (IC)

Students were also asked to rate how helpful their interaction with the IC was in understanding the content of the course (Table 19). The ratings for the ICs are much higher than ratings of the instructor on the same question. Ninety-six percent of the students in 71L10 rated interaction with the IC *Helpful* or *Very Helpful* in understanding the content of the course. The lowest rating was in the 76Y10 course, where only 73% of the respondents judged the interaction with the IC to be *Helpful* or *Very Helpful* in understanding the content of the course. All but one of the means on this item were over 4.0 (*Helpful*). Overall, students appeared to consider the IC an important part of the program. As noted earlier in this objective, the narrative data indicated that the students' daily personal contact with the IC led to a more positive evaluation of the IC when compared to the instructor.

Table 19
Student Ratings of the IC

Interaction with IC in Classroom

	71L10	76Y10	95B10	HAZ	TQL
$\bar{X}$ (SD) N	4.72 (.52) 32	3.92 (1.38) 40	4.40 (1.00) 25	4.39 (.66) 110	4.21 (.91) 47
% Helpful/ Very Helpful	96	73	92	90	85
Overall Performance of IC					
$\bar{X}$ (SD) N	4.61 (.70) 33	4.30 (.94) 40	4.38 (.94) 26	4.31 (.72) 111	4.48 (.62) 48
% Very Good/ Excellent	88	83	89	86	89

Students also rated the overall performance of the IC (Table 19). Results indicate a very positive assessment of the IC's role in the classroom; ratings ranged from a high of 89% ranking the IC as *Very Good* or *Excellent* (95B10 and TQL) to a low of 83% (76Y10). These means reflect a very positive assessment of the ICs. Narrative data support the hypothesis that the high ratings of the IC resulted from the proximity of that individual to the students in the classroom.

Student Ratings of the Military Site Coordinator (MSC)

Students were asked to rate how helpful the MSC was in helping them understand the content of the course (Table 20). There were no data reported by the HazWaste and TQL courses on this item because only the MOS courses had a MSC in the classroom. Though all the ratings were high, 100% of the students in 95B10 rated the MSC as *Helpful* or *Very Helpful* in aiding them to understand the content of the course. Actually, this is not too surprising. In the 95B10 course, the MSC conducted the off-line physical activities, and provided a frequent and necessary link between the students and the course objectives.

One final measure is the students' ratings of the overall effectiveness of the MSC. Again, ratings for the MSC in all courses were high. At the least 85% of the respondents rated the MSC as *Very Good* or *Excellent*.

Table 20
Student Ratings of the MSC

	71L10	76Y10	95B10
Interaction with MSC in Classroom			
$\bar{X}$ (SD) **N**	4.59 (.71) 32	4.15 (1.25) 40	4.76 (.44) 25
% Helpful/ Very Helpful	94	81	100
Overall Performance of Military Site Coordinator (MSC)			
$\bar{X}$ (SD) **N**	4.36 (.74) 33	4.35 (.89) 40	4.69 (.55) 26
% Very Good/ Excellent	85	91	96

In summary, students were generally positive about the instructional team and found the ICs particularly helpful. In the narrative data, students raised questions about the content expertise of the civilians but they were otherwise favorable about the instructional team's effectiveness.

Conclusions

In examining the effectiveness of the VTT courses, the results of both the quantitative and self-report data indicate that the VTT instruction was successful in helping students master the learning objectives. The results indicate that significant improvements were made in scores from the pretest to the posttest for four of the five courses. Students in the fifth course, TQL, were not administered a pretest, so no comparison data is available. In addition, the average number of students who passed the PTs on the first attempt was 90.03% for 71L10, 97.99% for 76Y10, and 94.5% for 95B10.

The background variables that predicted objective performance and subjective assessments of achievement (e.g., relevance of the current PMOS, computer skills) were those that would be expected to predict performance for any type of course delivery medium. Similarly, the background variables did not tend to predict ratings of course materials and processes, nor overall course ratings. The few significant correlations that were obtained could likely be observed in traditional military courses as well. Thus, these results suggest that there is no need to structure VTT courses differently for different student populations. Relatedly, there appears to be no need to select a specified population of students for VTT courses versus traditionally taught courses.

A comparison of the instructional methods used in the various courses was attempted. However, the instructional methods could not be accurately compared because there were so many other variations in the courses (e.g., total number of hours, FTXs, etc.). Since all students in the VTT courses met criterion, it can be assumed that the instructional methods used in the VTT courses were effective.

Both students and instructional personnel rated the learning methods, interactivity, and other course characteristics developed specifically for the VTT courses to be generally effective. Of these ratings, the amount and types of interactivity were the most highly rated (24 of 29 ratings were at 4.0 or above). Time to cover the course topics was consistently rated lowest. This finding is consistent with the distance education literature that states that VTT courses take longer to present than traditional courses. Students rated the overall quality of the five courses as 3.19 (95B10), 3.55 (76Y10), 3.59 (71L10), 4.04 (HazWaste) and 4.10 (TQL), indicating that students thought the courses ranged from slightly better than *good* to slightly better than *very good.*

The data gathered from a variety of observations indicated students had a high level of interest in the VTT system of instruction and a very favorable attitude toward taking future military classes via VTT at a community college site. Therefore, this method of instruction appears to be an effective option when considering the delivery of training to remote sites.

Fifteen different evaluation items rated the effectiveness of the instructional team from the students' perspectives. Most (67%) of the measures of the instructional team focused on the civilian VTT instructor, with the balance of the questions addressing the effectiveness of the IC, MSC, and the MIA. ICs, MSCs, and MIAs were evaluated on their interactions with students in the classroom and their overall performance. Seventy percent of these were above 4.0, reflecting the respondents' positive reactions to members of the team. Of the remaining ratings, 28% were between 3.0 and 4.0, and only 2% were below 3.0.

In summary, looking at demographic data, it appears that VTT is an acceptable approach for the general military population, because this data predicted success in the VTT courses as similar data would have predicted success in traditional courses. Thus, standard military requirements and course prerequisites are adequate for selecting students for VTT courses. Also, 100% of the students in the MOS courses mastered the learning objectives specified in the courses.

Issues

When designing VTT courses, appropriate VTT instructional strategies and methods, including multiple chances for interaction, must be designed into the instruction. In addition, attention must be focused on course design and development to ensure that each course takes advantage of the VTT environment, and that the components of the course are consistent. Thus, one of the key tenets of effective VTT is that the instruction must be more carefully planned than traditional instruction.

This planning should also take into consideration the fact that it takes longer to teach using a teletraining system than it does in a standard classroom. This means that platform courses converted to VTT will require either a longer training period to cover the same topics or that some topics or activities must be shortened or deleted from the instruction.

The proponent schools for 71L10, 76Y10, and 95B10 may be able to use the data on the numbers of students who passed the PTs on the first attempt as a way to determine whether certain tasks in their curricula might need to be redesigned or revised. The proponent schools might use these data to analyze both the instruction and the PTs where a large percentage of students had to retake the PT to reach mastery.

Word pictures and graphics may lose their effectiveness in longer courses, perhaps especially when they are used extensively, thus reducing their novelty. Comments from a few of the 95B10 and TQL students were that "word pictures can seem too low-level and simplistic if care is not taken to make them meaningful." Use of word pictures may vary according to the educational level of the students. However, the fact that the word pictures and graphics were rated as *helpful* (3.0) may mean that students do need the focus that word pictures provide.

While opportunities to interact with students at other sites were built into the instruction, there were fewer opportunities for this interaction because such interaction was time consuming and the audio protocols for talking to each other across sites were more complicated than simply talking to the instructor. Due to technical characteristics of the TNET equipment it is doubtful that the audio protocols could be modified very much. However, when using TNET in the future, close attention needs to be paid to how to maximize interaction among students over the network.

In order to assess the effectiveness of VTT courses with corresponding traditional courses, student performance data must be available regarding both methods of instruction and performance results. However, the FTP did not have access to this data and thus an empirical investigation comparing subjective ratings and actual performance in the VTT courses with their traditional counterparts could not be conducted. For future studies, this data must be available

for any comparisons to be made. In general, however, past research has shown that VTT students master the learning objectives as do students in traditional courses.

Another issue is that an assessment of the instructional team's effectiveness could be broadened by administering more objective evaluation items to instructional team members. These items could be framed much like the evaluations given to the students. Though the sample size would be small (limited to one instructional role (IC, MIA, MSC) for each course at a remote site), additional quantitative data on the instructor and other team members may provide useful information. In addition, the Instructional Manager, Instructional Designers, Instructional Production Managers and Instructional Technology Specialists would probably have valuable information about the effectiveness of the instructional team.

Success of the FTP was due to careful planning of the project. For example, contingency plans were developed so that no instruction would be missed due to equipment failure, instructional personnel were well trained for their respective roles, there was excellent support from military organizations and personnel, and there were coordinated efforts of community college, military instructors, and support personnel. It is expected that any VTT course would require a similar effort.

OBJECTIVES RELATED TO THE COMMUNITY COLLEGES

Community Colleges as Providers of Military Instruction

An increasing need for educational services for the reserve forces has prompted local colleges to become providers of military training. This need is due to: (a) the fact that reserve units often need additional or new training because they have received new equipment, been reorganized, or have changed missions (Watt, 1988), and (b) the fact that the educational standards for service members have been raised. The Army Regulation (AR) 621-5 sets the minimum goals for members of the National Guard and the U.S. Army Reserve. By 1 October 1989 all enlisted persons in the Army RC were required to have a high school diploma or a GED. Enlisted personnel and Warrant Officers are required to have an associate degree by their fifteenth year of reserve service; commissioned officers must hold a baccalaureate degree in order to be promoted to grade O4 by their eighth year of service.

These educational needs require new solutions to military training options. Watt (1988) reported that the National Guard Bureau recently called a roundtable meeting to promote more and stronger links between local colleges and National Guard units. This upper level military support accompanied by programs that help defray the costs of tuition, e.g., the "Montgomery" GI Bill and the Army Continuing Education Support (ACES) program, along with other more traditional financial support (e.g., student loans), is making the local colleges a very attractive place for soldiers to attain college credit and degrees.

The educational needs of the RC typically fall into one of three major areas: developmental studies, *military skill training at the unit level, and individual and continuing* higher education (Watt, 1988). Watt reported that there are several educational programs that link the military and local colleges to provide training in these three areas. While these college and military educational partnerships were varied in terms of the extensiveness of the programs offered, the number of credits awarded, and how tuition, fees and expenses were paid, Watt (1988) reported that "even with the cost of paying for full time duty, the expense for the Guard is less than to send a person to an active duty Army service school. Moveover, the Guard is finding it easier to get companies to release their employees for a year to go to a local college than to send them 'off' somewhere to an Army post for the same period of time" (p. 8). Some examples of these programs are:

- The U.S. Navy Reserve recruits a qualified person for some medical units and sends the reservists to a local college that has an approved program in the needed field.

- A local college in a midwestern state taught a 192-hour course at the unit's drill site in each of three job skill areas (carpenters, plumbers, and electricians) because the reserve unit construction team needed the training and could not provide it themselves.

- A Reserve Forces School and a two-year college in the northwestern part of the U.S. started a partnership to teach classes in utilities and power generation repair. The students received military certification and college credits.

- A technical college in South Carolina designed and developed a one-year certification program for National Guard personnel in precision measuring equipment. Students earned 73 quarter hours of credit and were awarded the appropriate military occupational specialty.

- A college in Tennessee conducted computer orientation classes for the state's National Guard using their equipment and software.

Watt suggested that local colleges with the greatest number of innovations will be the most successful providers of military training. Some of the most important considerations are:

- "using the armory or drill hall as the location for class delivery;

- scheduling classes at times more convenient for the reservists, e.g., the evening prior to a weekend drill or the evening between the two days of a weekend drill;

- offering courses in formats other than the usual classroom mode, e.g., cable television;

- accepting comparable course completion through use of CLEP or locally devised tests" (p. 12-13).

In summary, the need for military units to retrain, for military personnel to earn associate and bachelor degrees, and the reservists' limited training availability (a reservist is only available for the equivalent of thirty-eight calendar days a year (Watt, 1988)) makes local colleges and military units a natural partnership. Watt stated that the reserve forces are an underserved educational population and that local educational institutions can meet many of the reservists' needs. Evidence exists that such partnerships can work and that they provide many benefits to both the college and the reserve unit. The FTP was designed in part to test the capability of the community colleges to provide VTT instruction to reservists.

Objective C1
Assess the Existing Technical Capability of the Community Colleges to Provide VTT Instruction (Facilities, Equipment, Personnel)

A review of the facilities, equipment, and personnel at the origination site (FCCJ) and the remote sites (VCC, SPJC, and FCCJ2) was necessary to determine their technical capabilities in delivering the VTT instruction. Analysis of these capabilities is critical in calculating two important variables: (a) the number of students that can be accommodated through the program, and (b) the cost of providing all community college sites with the equipment and technicians to successfully deliver the instruction.

This objective regarding the technical capability and the next one (C2) that assesses the instructional capability of community colleges are two sides of the same coin. One could effectively argue that technical capability is included in the description of instructional capability. Electronic media and other information delivery systems are essential elements of instructional packages. However, technical capability is required to design and deliver courseware, e.g., to produce graphics and videotapes, and can therefore be addressed independently of instructional capabilities. The scope of the FTP required the evaluators to analyze segments of the community colleges' capabilities. Additionally, both the technical and instructional capabilities can be evaluated, partly at least, by the types of staff training that were required for conducting the project. Staff training is addressed in Objective C3.

In discussing this objective it is important to understand FCCJ's position in the state regarding instructional TV resources. FCCJ is one of five (of 28) community colleges in Florida to have extensive instructional video production facilities and equipment. SPJC and VCC were not included in this group of five, and their transmit and receive capacities were provided only by the TNET equipment. It was therefore neither expensive nor difficult to upgrade the video capabilities at FCCJ to serve as the origination and production site to conform with the course design and TNET requirements. All three sites were staffed with experienced personnel to support the technical needs of the project. In most cases, there was no need to hire new people to fulfill that role; existing personnel were reassigned from their regular duties to cover the FTP needs.

FCCJ is typical of community colleges involved in instructional video production in that it has a full production and post-production facility. The production equipment included a broadcast-quality studio and portable cameras, sound equipment, and a special effects generator to supplement the editing video recorders. Personnel included the production manager, chief engineer, and various production support personnel. The Instructional Television Manager at FCCJ provided a list of equipment, facilities and personnel at the origination and remote sites, as well as a list of what was added to meet VTT requirements. Table 21 lists the facilities, equipment, and personnel that existed at the origination site when the project started and what was added or modified to FCCJ in order to produce and present TNET instruction. Neither SPJC nor VCC had the technical capabilities to produce the instruction.

Table 21
Origination Site: FCCJ

A. What existed in the TV production facility prior to FTP:

Facility: TV studio with full production and post-production capabilities

Production Equipment:
- 2 Sony M-7 chip cameras
- Sony SP portable record decks
- Lights, wireless microphones, and other standard ancillary field equipment, such as monitors
- Consumables, such as tape stock and batteries
- Teleprompter (in studio productions)

Post-production Equipment:
- Sony SP editor and decks
- CEL for DVE (Digital Video Effects)
- Ross Switcher
- Amiga 2500 (Toaster) for character generation and some animation
- Compact Disc (CD) player and cleared music library were used for music source

Personnel:
- TV Production Manager
- Chief Engineer
- A-V Technicians
- Administrative Support Personnel
- Production Staff:
  - Cameraperson/Editor
  - Computer Graphics Specialist

B. Technical Requirements Added for VTT Instruction:

Facility:
- Video segments and computer graphics were designed into the instruction, but a TNET course could be presented without them. For the FTP, the following was needed:
  - Production and post-production capabilities for off-site shooting
  - Computer graphics generation for editing
- FCCJ facility was modified in the following ways:
  - Added back-up generator for electrical power
  - Two analog telephone lines had to be added
  - Cellular phone in case of power outage

Equipment: With the exception of the TNET gallery, all the following equipment existed at FCCJ, but was needed and was supplemental to TNET:
- A VHS tape player and audio cable connected to TNET
- Additional lights
- A lavaliere microphone
- A 5" monitor connected to the ELMO allowing the technical assistant to focus and center visuals before displaying them
- An audio cassette deck to transmit pre-recorded music over the network
- A set used as a backdrop to the VTT instructors with appropriate course-related logo mounted and hung on the set framework behind the instructor

Personnel:
- Network Production Assistant
- Existing personnel were reassigned from their regular duties

The standard TNET classroom equipment package from AETD was added at all sites (Appendix H), ensuring that any of the sites could function as an origination site. The number of students at each site was limited by factors related to the technology. No more than 15 students were assigned to a classroom in order to: (a) give everyone a clear view of the TV monitor, (b) for everyone to be seen well by the classroom camera, and (c) to control the amount of time-consuming interaction with the instructor. While a maximum of 15 students is not a TNET directive, FTP program designers thought more than fifteen students in the class would inhibit opportunities for questions or responses from students, and cause the course to run longer than the prescribed period of time. Although seven receive sites was considered the maximum advisable with the TNET system, only five receive sites were in operation at any one time. Table 22 lists the facilities, equipment, and personnel at the remote sites. Table 23 lists the roles and responsibilities of the technical personnel at the origination and remote sites.

The remote site at FCCJ (FCCJ2) was a special case because this site was used as an official visitation center during the project and as field test or intensive site during the MOS courses. The classroom was modified for this purpose, e.g., installing a one-way mirror for visitors. These modifications are included in Table 24.

At the end of the instruction all of the TNET classroom equipment was removed from the sites and returned to the government.

Table 22
Remote Sites: SPJC and VCC

A. What existed prior to FTP:

Facility:

- Basic classroom designated for TNET use (SPJC converted space for classroom use to meet the requirements)
- Size and temperature requirements for TNET were met
- Tables and chairs for regular classroom seating

Equipment:

- VCR for remedial instruction and contingencies available for use as needed

Personnel:

- A-V/Television coordinator at each site

B. What was Added/Needed for VTT Instruction:

Facility:

- Special wiring for TNET
- Close to smoking/snack/restroom facilities
- 95B10: space for hands-on practical exercises

Equipment:

- Standard TNET Classroom equipment
- Telephone
- Access to Fax
- Filing and storage areas/cabinets
- Scale for weighing students in at the beginning of each MOS course
- 71L10: Typewriters
- 76Y10: Microfiche readers
- 95B10: MP course related equipment

Personnel:

- Hired Site Technicians (Backup)
- Facilities Coordinator -- reassigned from regular duties
- Administrative POC -- reassigned from regular duties

Table 23
Technical Personnel Roles and Responsibilities

Network Manager - responsible for the technical aspects of course delivery via the TNET system and for coordinating efforts among the technical personnel at the remote community college sites with the Network Control Center (NCC).

Chief Engineer - responsible for ensuring that the technical requirements of the TNET system were met as specified by the NCC.

Network Technician - assisted the Chief Engineer by providing technical assistance and back-up.

Cameraman/Editor* - Cameraman/editor for the video vignettes.

Computer Graphic Artist* - Computer graphic artist for various graphic designs and the countdown tapes.

* Technical assistance required for course development

Site Technician - responsible for the technical aspects of the TNET system; i.e., to ensure the system was up and running on time for course delivery. The technicians coordinated with technical personnel at FCCJ and performed minor troubleshooting at the community college site.

The responsibilities of the On-Site Technician included:

- opening classroom
- powering-up system and testing daily
- coordinating TNET schedule with FCCJ and NCC personnel
- performing limited troubleshooting and maintenance activities via the telephone with FCCJ and NCC
- participating in AAR as needed
- terminating conference daily
- maintaining TNET log

Facilities Coordinator - the point of contact for scheduling and providing access to the designated classroom as needed during the project. Specifically, the Facilities Coordinator interfaced with members of the Florida Teletraining Project Team to:

- maintain security of the designated classroom (specified in Network Guidelines)
- process reservations for and provide access to, the designated classroom for course delivery, visitation, and project evaluation
- coordinate access to the designated classroom for TNET equipment maintenance when required
- maintain the obse[illegible]nd visitor logs
- receive and sign f[illegible]ment prior to installation
- oversee de-installation

Table 24
Remote Site: FCCJ2 -- Intensive Site

A. What existed prior to FTP:

Facility:

- Same as other remote sites

Equipment:

- Same as other remote sites except that a small room or office adjacent to the classroom was needed as a viewing/visitor area

Personnel:

- Same as other remote sites

B. What was Added/Needed for VTT Instruction:

Facility:

- Added:
    - one-way mirror/glass for viewing by visitors
    - viewing area was wired for sound

Equipment:

- Added:
    - TV camera and tape deck to record instruction for remedial and contingency purposes
    - Telephone in observation room

Personnel:

- Same as other remote sites

Results of the Data

There are only a few evaluation measures of the community colleges' technical capabilities. In one example, students in all courses rated the performance of the technician working the equipment on a 5-point scale, with *Excellent* being the highest rating (5) and *Poor* being the lowest (1). Table 25 presents these results. As can be seen from the data, the technicians for all five courses were consistently rated as better than *very good.*

Table 25
Student Ratings: Performance of Technician Working Equipment

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
$\bar{X}$ (SD) **N**	4.45 (.75) 33	4.68 (.47) 38	4.08 (.81) 25	4.28 (.78) 109	4.47 (.62) 47
% Very Good/ Excellent	85	100	80	82	93

Administrative Point-of-Contact (POC)

Another source of information regarding community college technical support was the end-of-course review provided by the POC. The POC was responsible for overseeing and coordinating the project activities at each community college remote site. Each POC was asked to rate how difficult it was to perform various project tasks: to find a suitable classroom, equipment, and to find staff to administer the courses. *Very Easy* tasks were rated 5; *very difficult* tasks were rated 1. These results are presented in Table 26. The data indicate that POCs found little difficulty in securing site commitments on various technical variables. Note, however, that a small sample size on these items makes it inappropriate to make broad generalizations from the data.

Table 26
POC Ratings: Difficulty in Securing Site Commitments
(MOS Courses Only)

[illegible]	[illegible]	[illegible]	[illegible]
Space	5.0 (0.0) 3	4.33 (.99) 3	5.0 (0.0) 3
Equipment Set-Up & Maintenance	4.33 (1.16) 3	4.33 (1.16) 3	5.0 (0.0) 3
Equipment Provided by CC	4.0 (1.0) 3	3.67 (1.53) 3	4.67 (.58) 3
Site Staff	4.33 (1.16) 3	4.67 (.58) 3	4.67 (.58) 3

Project Evaluators

One other measure of community college technical capability was a checklist of effective course delivery conditions completed by the project evaluator at each site on the first day of instruction for each of the MOS courses. This checklist included a number of technical and personnel items, such as facilities, equipment, and community college support. No statistical data were generated from this evaluation. If a problem occurred a corresponding category was checked. However, narrative data related to this checklist indicated that all the technical requirements for VTT at each community college, and all back-up procedures, were available and ready for use on the first day of instruction for all the courses for all the sites.

In summary, this objective addressed the technical capability of the community colleges to provide VTT instruction, theorizing that this technical capacity would affect the number of students that could be processed through the courses. While technical constraints did limit the number of students, this restriction was more a function of course design issues and TNET requirements than the community colleges' equipment, facilities and personnel. A review of the equipment and personnel required for TNET indicated that each community college needed to provide technical resources to support VTT instruction, and that they were able to do so.

Objective C2
Assess the Existing Instructional Capability of the Community Colleges Related to Military Course Development and Delivery (Expertise, Personnel, Instructional Resources)

The purpose of this objective was to describe the instructional, rather than the technical resources of community colleges, focusing on their strengths and weaknesses relative to designing, developing, and delivering the instruction. For example, to what extent do the faculty have the knowledge bases to design and deliver military instruction? Community colleges traditionally use many adjunct faculty members trained to teach a variety of specific topics covering a wide range of interests. These instructors, plus the regular staff, may comprise a pool of talent from which individuals can be drawn to staff innovative courses.

According to the Project Director at FCCJ, the mission of the community college is to offer viable educational opportunities to all members of the surrounding community; these opportunities are not available from traditional four-year institutions of higher learning. Community colleges have forged bonds with private industry and public agencies designing programs and curricula in response to specific needs. VCC in Orlando describes itself in its catalogue as an imaginative institution of higher education; it offers courses, seminars and workshops at multiple campuses and centers utilizing traditional class curricula, as well as emerging instructional technologies. SPJC contends in the foreword to its catalogue that it seeks to respond to changing educational needs with flexibility and innovation in the way services are provided, providing technical assistance, customized training, and other professional services for business and industry.

Additionally, the growth of community colleges has given most major communities a chance to house a college or a network of urban and suburban campuses. Community colleges are now within a reasonable distance for most people, providing them with ready access to college programs and resources. Community colleges have also been innovative in selecting unorthodox sites for outreach campuses. For example, FCCJ uses a large section of a suburban mall as classroom space for its students. The combination of a skilled and diverse instructional staff, current industrial technology, and a broad geographical dispersion make the community college a natural location for projects with uncommon requirements. The campuses appear to be uniquely qualified to provide instructional and logistical support for a program like the FTP.

Results

Information assessing the instructional capabilities of community colleges was not available in objective measures but was found in the narrative data gathered from administrators, instructors, and evaluators. Responses were broadly categorized into three areas: types of instructional personnel needed for a project such as the FTP, expertise of personnel, and instructional resources.

Instructional Personnel. There were two primary aspects of the instructional component of the FTP: (a) design and development of the instruction and (b) delivery or implementation

of the instruction. The community college instructional personnel required for the FTP were: VTT instructors/course developers, ICs at the remote sites, and an instructional manager. The VTT instructors/course developers and the instructional manager were community college faculty from FCCJ; the ICs were community college faculty at the remote sites. The primary selection criteria for the VTT instructors/course developers and ICs was content expertise; the primary selection criteria for the instructional manager was broad instructional and technical expertise.

An administrative decision was made that the course designers would also serve as the VTT instructors and present the courses to the students. This was not an arbitrary decision because it was assumed that the individual who designed the instruction would be better prepared to deliver it. Since the timeframe for design and development was limited, the course developers served as the on-camera VTT instructors. However, another option would have been to select one group of faculty to develop the courses, and a different group to deliver the instruction.

In addition to the VTT instructors/course developer, another person needed for the instructional team was an instructional manager. This person was responsible for coordinating the instructional and technical components of the courses. He was also the liaison between the Instructional Television Manager at FCCJ and the ICs.

The ICs were selected to be involved in the project by the community college where they were a faculty member. They were selected based on their subject matter or content expertise for a particular course. The roles and responsibilities of the VTT instructors and the ICs are listed in Table 27.

Expertise. All instructional personnel for the FTP were professors, either full time or adjunct, at the community colleges. At the origination site, four of the five VTT instructors were faculty members selected from departments closely associated with the course they would be teaching. For example, the 71L10 instructor was a professor of Office Systems Technology. The exception was the 76Y10 instructor who was a professor of English. Since there were no departments or programs that approximated the content of the 76Y10 course, Unit Supply Specialist, this professor was selected because of his previous course development experience and teaching ability.

Community college faculty are professional educators. As such they are typically good teachers. However, part of their role for the FTP was to develop as well as present the courses. While all of them had designed numerous courses in their own fields, none of them were professional instructional designers. Therefore, they did not know the SAT model in its entirety. They were, however, knowledgeable about components of the SAT, e.g., behavioral objectives.

Table 27
Roles and Responsibilities of Instructional Personnel

VTT Instructor	Instructional Coordinator
• Reconfigures military courseware for VTT	• Directs all on-site activities
• Serves as primary instructor	• Distributes handouts and materials
• Presents content and graphics	• Directs/controls audio at remote site
• Directs VTT activities	• Coordinates questions to origination site
• Explains PEs and provides feedback	• Leads discussion groups
• Paces instruction	• Participates in daily AAR
• Conducts daily AAR	• Becomes the VTT instructor when baton is passed
	• Directs remediation, makeups and contingency plans
	• Collects data

It is not unusual for faculty members at community colleges or at four-year institutions to be excellent teachers, but not to be course developers in the structured sense of the SAT. The VTT course development process required a precision that is not typically used when conducting platform instruction. To eliminate this deficiency, staff training about the SAT course development was presented to the course developers.

The Instructional Manager at the origination site was a professor of Computer/Information Systems. His expertise in computers was invaluable in using the computer software needed to develop the graphics, and in interfacing the computer and VTT equipment. While this professor did not do any of the VTT teaching, a component of his role was to oversee the design and development of the courses. Consistent with the skills of the other professors, he was not a professional course developer proficient in the use of the SAT model. As a consequence, FCCJ hired a consultant who was a professional instructional designer to assume the role to work with the faculty as they developed the VTT courses.

The ICs at the remote sites were also either full-time or adjunct faculty members at their respective institutions. With the exception of the 76Y10 course, all ICs were selected from departments or programs closely allied with the course being delivered. This was especially necessary for the 71L10 course because the IC taught the typing component of the course. For the 95B10, Basic Military Police, the ICs were proficient in civilian law enforcement. Due to a military student certification requirement, the MSCs for 95B10 were certified MP instructors. However, because the students also received college credit, the 95B10 ICs were professors from related disciplines.

Only one of the VTT instructors and only a few of the ICs had military expertise or experience. The 95B10 instructor had at one time held the MOS in Basic Military Police and one other VTT instructor had taught a course for the military. Several ICs had military experience, but none of them held the MOS or certification in the courses for which they were assigned. This lack of military experience prompted the FTP to: (a) hire a military training specialist and (b) obtain military SMEs in each of the five courses that were being delivered.

In summary, while the four of the five faculty at FCCJ were experienced teachers in the content area of the course they were designing and delivering, none of them had VTT experience, they had very limited instructional design experience, and limited military experience or background. At the remote sites, with the exception of the 76Y10 faculty, all were selected from related content areas for the course that they were participating in and they were also experienced community college teachers. (While they were not community college faculty, it is important to note that the support personnel at the Rhode Island and Alabama sites did not have content expertise in HazWaste and TQL).

Instructional Resources

Some of the instructional resources (e.g., typewriters, microfiche, videotape recorders etc.) were previously listed in the tables included in Objective C1. These technical resources were

used for instructional purposes, but were maintained and often supplied by the technical staff. A few additional comments about instructional resources are included here.

Personnel at all campuses provided the space as specified by the TNET requirements for the program. Inevitably, some campuses had better facilities than others; for instance, the small FCCJ2 classroom often restricted movement for some in-class activities such as typing and the 95B10 PEs. In the 71L10 course, poor typewriter maintenance created problems in getting all the students to the MOS required typing speed. The 95B10 course had special requirements for its hands-on training, and some sites were better suited than others. For example, students at SPJC were at a modern criminal justice training facility, and they praised the quality of the equipment and resources. Students at FCCJ2 were less positive in their assessment of the facility.

One final facility problem revolved around the all-week instructional schedule. Coordinators found that many college support services, such as access to libraries and copy and fax machines, were unavailable during the weekend classes. The problems were solved as needed for the project, but in the future, attention to the instructional support requirements for the courses should be carefully considered.

Despite the problems, personnel at the community colleges were unanimous in supporting more joint efforts between the military training establishment and community colleges. Each group would like to design courses to fit its own needs more closely, for example, civilians would like college credits awarded more easily, and the military would prefer instructors who are MOS qualified, but all would like the opportunity to work with future programs. As the POC at VCC said, "It's a win-win situation for everybody."

Student Responses

Students were asked if they thought there were advantages to having the course offered at a community college instead of a military institution. The results are presented in Table 28. Ninety-seven percent (N=96) of the students responded to the question. Eighty-two percent (N=79) considered the community college atmosphere preferable to that of the military classroom, while 18% (N=17) considered the college classroom no different or not as good as a military setting. While this item does not specifically address the instructional capabilities of community colleges, it does approach the concept indirectly. The advantages of the community college site reflects in part the instructional capabilities of the institution.

Table 28
Student Ratings: Advantages of Community College Sites

[illegible]	% Favoring CC Site (N)	% Neutral or Not Favoring CC Site (N)
SPJC	87% (26)	13% (4)
VCC	97% (31)	3% (1)
FCCJ2	65% (22)	35% (12)
Total	82% (79)	18% (17)

In summary, there was little information available from the course evaluations that directly addressed this objective. A conceptual analysis of the community colleges' faculties' skills and knowledge bases was the primary input for this objective. With their comprehensive missions and variety of flexible academic programs, community colleges appear to have the resources to adjust to the specific instructional needs of military training. The faculty are experienced teachers and have some informal course development skills. They are typically lacking in military expertise. However, given sufficient time for planning and staff training, the community college faculty in the FTP were able to design, develop, and implement very good VTT courses. The community college regards program flexibility as a necessary element in its relationship to the community, so this objective is best analyzed over a long period of time.

Objective C3
Determine the Types of Staff Training and Technical Assistance Required By the Community Colleges to Develop and Implement a Teletraining Approach to Military Instruction

The purpose of this objective was to: (a) describe the types of staff training that were conducted for the FTP personnel who were developing and delivering the VTT instruction, and (b) assess the effectiveness of the training. Training was conducted for five groups of instructional staff. The administrative teams at IST and FCCJ attended some of the training sessions as dictated by their respective roles. The five primary groups who received training were:

- the VTT instructors/course developers
- the MIAs who were the SMEs for course design and development, and the on-camera military instructors for the course
- two groups of remote site facilitators: the ICs and the MSCs
- technical personnel at both the origination site and at the remote sites
- graphic artists who produced the word pictures and computer graphics that were used during course delivery.

Table 29 provides an overview of the types of training provided to each of the five groups of personnel.

Instructional Personnel: Course Developers, MIAs, ICs, MSCs

The most extensive and intensive training was presented to the VTT instructors/course developers. None of the community college personnel were instructional developers or had taught VTT courses. In addition, they were responsible for converting military courses from a standard or traditional platform format to VTT. Therefore, they received a series of training workshops that varied in length from several hours to several days.

The first block of instruction was presented by Dr. Thomas E. Cyrs, New Mexico State University. This workshop was presented to the course developers and to project personnel from FCCJ, IST, and DITRA. Cyrs' two-day workshop, Essential Skills for Television Teaching: There is a Difference, focused on how to design interactive learning strategies, prepare on-line and off-line questions for students, develop word pictures, and produce an interactive student study guide. He also described the components and processes needed to modify courses for television teaching (e.g., pre-planning, course design, and staff training) and he demonstrated how to present a positive image on television.

Table 29
Types of Training Provided to FTP Personnel

▸ "Essential Skills for Television Teaching" ▸ Instructional Design Theory ▸ Selecting & Using Media ▸ Selecting & Using Instructional Strategies ▸ Overview of Military Training			▸ "Essential Skills for Television Teaching" (FCCJ only)	
▸ TNET Workshop I & II (AETD)			▸ TNET Workshop I (AETD)	▸ TNET Workshop II (AETD); Specialized Session for TNET Graphics
▸ "Putting It All Together"	▸ "Putting It All Together"	▸ "Putting It All Together"	▸ "Putting It All Together"	
▸ Television & Presentation Techniques (FCCJ)				
▸ On-the-Job Training ▸ Crs. Design ▸ Teaching ▸ TNET	▸ On-the-Job Training ▸ Crs. Design ▸ Teaching ▸ TNET	▸ On-the-Job Training ▸ Instruct. Team Practice ▸ TNET	▸ On-the-Job Training ▸ Individual TNET w/AETD ▸ Inst. Team Practice ▸ TNET practice	▸ OJT/Pilot Testing ▸ Color ▸ Size ▸ Fonts ▸ Clip Art

In the second block of instruction, a series of ISD workshops were presented to the course developers. Workshop topics included: (a) basic principles of learning theory and instructional design, including how to analyze and write learning objectives and how to use the conditions of learning and events of instruction (Gagne, 1985), (b) principles of media selection and utilization, (c) instructional strategies and methods for VTT, (d) an overview of the TNET system and its *instructional capabilities*, and (e) an overview of military training, including the Army's requirements for Reserve and Guard training, IDT vs. ADT, and the components of a standard Army syllabus.

The next block of instruction, TNET Workshop I, was presented to the technical personnel from FCCJ and the remote sites and to the course developers/VTT instructors. The primary purpose of this workshop was to provide the technical personnel with an in-depth orientation to the TNET system. Personnel from AETD installed the TNET equipment at FCCJ prior to the workshop; this equipment was then used for training purposes. While the primary purpose of this training was intended for the technical personnel, the course developers also were taught the basic functions of the equipment and had the opportunity to practice using TNET.

A second TNET workshop presented by AETD, TNET Workshop II, was presented to the course developers and the graphic artists. This workshop focused on the instructional rather than the technical capabilities of the system. During this workshop, the AETD staff worked with the graphic artists and production team to assist them in designing and producing instructionally sound graphics for VTT.

The final block of formal staff training, Putting It All Together, was a two-day workshop presented to all project personnel including the course developers, MIAs, ICs, MSCs, technical personnel and the administrative POCs at each remote site. The purpose of this workshop was to: (a) explain the technical and instructional roles and responsibilities of each participant, (b) explain the specific instructional procedures that each participant should follow when implementing VTT using TNET, and (c) provide the opportunity for project personnel to form the instructional and technical teams that would be necessary to implement VTT instruction. Topics addressed in this training included: a TNET orientation, classroom protocols, roles and responsibilities, contingency plans, project evaluation requirements and responsibilities, and network policies and procedures. As a conclusion to this workshop, the instructional and technical teams worked together to solve a series of problems that might arise during instruction.

In addition to the formal training, on-the-job training (OJT) individual and team training was implemented. This training included:

- A 13-page job aid, The Quick Reference Guide to Course Conversion, was provided to each course developer to assist them in developing the courseware. *This job aid was an abbreviated handout of key points and instructional ideas that* should be considered when designing VTT instruction.

- As the course developers/VTT instructors and the MIAs developed each lesson, they were given feedback and assistance in redesigning the lessons.

- The VTT instructors and MIAs were given instruction on television and presentation techniques by personnel at FCCJ. As part of this instruction, the VTT instructors and MIAs practiced a variety of instructional strategies and they practiced teaching over the network.

- As a component of the OJT, approximately ten sessions per course (for the MOS courses) were conducted where all the remote site coordinators and the technicians were present. These practice sessions were provided so that all personnel could refine their roles.

Technical Personnel

The technical personnel received individual training from the AETD staff on the TNET system when the equipment was installed at each remote site. The technical personnel also attended the Putting It All Together workshop and they participated in the OJT.

The graphic artists also received specialized individual training from AETD on how to design graphics for TNET. After the training, the graphic artists conducted an extensive formative evaluation of the graphics and word pictures. This pilot testing was a form of OJT since there was considerable trial and error to determine what colors, sizes, fonts, and clip art were appropriate for TNET and which graphics were instructionally sound.

Evaluations of the Staff Training: Quantitative Data

Putting It All Together. The only training that was formally evaluated by the FTP was the Putting It All Together workshop. This workshop was planned to insure that all personnel involved in implementing the VTT instruction would work together efficiently and effectively. This workshop was seen as a critical aspect of staff training. Participants were asked to rate various aspects of the workshop and it's effectiveness of the workshop in terms of preparing them to perform their project roles.

Regarding aspects of the workshop, eleven questions were asked about the quality of the training, for example, the clarity of the objectives, the number of opportunities provided to ask questions, the relevance of the topics, etc. Participants were asked to rate each question on a 5-point scale. The means ranged 4.14 to 4.95, indicating that the participants thought that the workshop was *very good* to *excellent*.

Participants were also asked about the adequacy of the training to prepare them to perform their roles and responsibilities for the FTP. Table 30 summarizes the results. Of the ten questions asked, eight had means of 4.00 or higher, indicating that the participants felt they were very well prepared to perform most of the roles and tasks that they would be asked to perform while implementing the VTT instruction. The lowest mean, 3.41, was obtained when participants were asked about how well prepared they felt to operate the TNET equipment.

Table 30

Participant Evaluation of the Putting It All Together Workshop

Relative to the specific objectives planned for the workshop, how well prepared do you feel that you now are for your roles on future project tasks? Circle one answer for each item.

Extremely Well Prepared ↓ *Very Poorly Prepared* ↓

5 4 3 2 1 N/A

N = 22

		$\bar{X}$(SD)	% 4&5
a.	*Understand instructional roles and responsibilities for course delivery.*	4.20(0.77)	72
b.	*Understand managerial/organizational roles and responsibilities for course delivery.*	4.45(0.60)	95
c.	*Perform basic TNET operations.*	3.41(0.45)	45
d.	*Implement contingency plans during course delivery.*	4.05(0.72)	77
e.	*Use the prescribed method to provide feedback (After Action Review) on a daily basis to the origination site.*	4.00(0.88)	63
f.	*Implement classroom instructional protocol during course delivery.*	4.42(0.61)	82
g.	*Understand instructional strategies that will be used via TNET.*	4.38(0.67)	96
h.	*Apply designated policies and procedures at the respective community colleges during course delivery.*	4.50(0.61)	86
i.	*Implement data collection and evaluation procedures during course delivery.*	3.90(0.97)	63
j.	*Follow prescribed procedures for make-up and remediation instruction during course delivery.*	4.15(0.59)	82

Participants were also asked open-ended questions about the aspects of the workshop that they felt were particularly effective, what needed improvement, and what kinds of follow-up training was needed. Two consistent themes emerged for each of the three questions. First, hands-on experience with the TNET equipment and how to use TNET were the aspects of the workshop that were listed most often as particularly effective. They were also listed as the aspects that needed to be addressed in follow-up workshops. Second, the interaction that took place between the civilian and military personnel during the workshop was listed as both necessary and effective; this interaction was also listed as an aspect of the workshop that should be addressed again in future workshops.

Sample comments about what was effective included:

- "The interaction between the military and civilians. It is two different schools of thought and it was essential that the military present it's (sic) needs. I think mutual respect was achieved on both sides."
- "Meeting people from the remote sites, time to practice on TV, one more of this 500 piece puzzle has fallen into place."
- "Hands-on equipment, good to problem solve with the military."

Sample comments about what was needed for future workshops included:

- "More instruction regarding technical functions."
- "Maybe a little more role-playing in use of equipment and maybe a view of military regs and POI. Overall the global presentation went well."
- "Would have liked to spend some time in a group with military/civilian personnel involved in special course I am facilitating."
- "More site interaction."

On-the-Job Training. In addition to the data obtained from the Putting It All Together workshop, a formal feedback system was established to provide information to the VTT instructors (for the MOS courses) and to the network administrators at FCCJ about the instructional, technical, and administrative aspects of their practice presentations. Each VTT instructional practice session was rated on a scale of 1 to 10 by all personnel attending the practice sessions at the remote sites (the ICs, MSCs, and any attending personnel from IST or DITRA). These ratings were used to provide feedback about the instructional and technical adequacy of the instruction. Corrective measures were devised as needed based on the data. FTP personnel expected that the feedback sheets would show improvements from the first sessions to the last; however, there were too many variations in the practice sessions to obtain reliable results.

Evaluations of the Staff Training: Narrative Data

In addition to the data presented above and as part of the overall project evaluation, the instructional personnel were asked what types of training they received and how effective the training was. The narrative data are consistent with data discussed above.

Essential Skills for Television Teaching. The FTP did not conduct a formal evaluation of Dr. Cyrs' workshop. However, the following are representative comments about Cyrs' presentation collected as part of the project evaluation:

- "Cyrs' workshop provided me with various options to use in choosing instructional techniques for the course."

- "I used word pictures as a basic outline format, eschewing the more elaborate and visually striking designs suggested by Cyrs."

The most concrete evaluation of the effectiveness of Cyrs' training was the fact that word pictures (Cyrs & Smith, 1990) were adopted as the primary means of displaying visuals during instruction and as the primary strategy used to create an ISG. Approximately 1000 visuals/word pictures were developed for each of the MOS courses and approximately 200 were developed for each of the special topics courses. Adoption of this strategy with few modifications attests to the value of Cyrs' workshop.

Workshops on Instructional Design, Selecting and Using Media and Instructional Strategies, and Overview of Military Training. Like the Cyrs' workshop, the workshops presented by IST were not formally evaluated. However, the community college personnel had no formal training in ISD and only one had conducted any military training. Their knowledge of ISD and military training was essential for them to convert the instruction from platform to VTT instruction. Representative comments from the VTT instructors about the adequacy of this training included:

- "Guidelines received from [IST personnel] played a major role in determining my instructional techniques."

- "I followed the principles of active learning as espoused in the workshops conducted by [IST personnel] and Cyrs."

- "The hounding voice of [IST personnel] was the primary incentive for selecting and using different types of interactivity during the course."

TNET Workshops I and II. No formal evaluation of the two workshops presented by AETD was conducted. However, the instructional personnel were consistent in making comments throughout staff training and course delivery that they needed to feel more comfortable with the TNET equipment. They also indicated they needed more time to practice using TNET even though there was a trained technician at each site when TNET was being used. The technical

personnel did not make any comments, positive or negative, about the need for further training on the TNET equipment. These comments from the instructional staff do not necessarily reflect any inadequacies in the AETD training. While the equipment is complex, it is not difficult to use. However, the comments about TNET from the instructional personnel do point to the need to provide considerable practice with any new technology.

Some representative comments from FTP instructional personnel include:

- "The difficulty of this medium is a matter of practice."
- "Need to be familiar with the equipment, only taught two hours on TNET."
- "[More] formal on network training program; had fear of crashing the network."
- "Just more practice time with the technology."
- "More of the same types of training [practice sessions over TNET. Cyrs workshop]."
- "Probably more TV training."
- "Need more hands on for all IC, POC, & technical."
- "Needed more training on how to run computer (was totally dependent on technician).

In summary, staff training is an essential aspect of presenting VTT instruction. The course developers/VTT instructors received the most extensive training running the gamut from how to reconfigure military courses for VTT delivery to technical training about how to use TNET. While they received considerable formal training and OJT about all aspects of implementing teletraining, they stated that they needed more training on, and practice with, the technology. Other non-technical personnel (ICs and MSCs) also indicated that they wanted more TNET training.

The Putting It All Together workshop was designed to help all instructional and technical personnel function effectively in the their respective roles and work together as a team. It was very effective, as indicated by means above 4.0 on all but two response categories. While not formally evaluated, the narrative responses indicated that the knowledge and skills gained from the other workshops, e.g., those presented by Cyrs and IST personnel, were important and necessary for designing and conducting VTT using TNET.

Objective C4
Determine the Fit Between Selected Military Training Needs and the Community College Curriculum

The purpose of this objective was to determine the areas of possible overlap between military training needs and the existing community college curriculum. While little project data was collected on this objective, some related research exists in the literature. Based on this research, a conceptual analysis of the military training needs and the community college curriculum was conducted.

Military Training Needs

The military divides its training needs into two broad categories: individual training (tasks that must be performed by a single person) and collective training (training for tasks that must be performed by groups of individuals). Collective tasks are often categorized by the size of the group that must perform them (e.g., squad, platoon, company, etc.), whereas individual tasks are categorized by who performs the tasks (e.g., leader tasks, soldier tasks and those tasks that are common to leaders and soldiers) (TRADOC 1990).

The military uses FTXs, situational training exercises (STXs), battle drills and constructive simulations to train collective tasks. Collective tasks normally involve actions that are performed during actual combat and are normally trained exclusively by the military. The military traditionally uses its system of formal schools to train individual tasks. Since many individual tasks require the use of non-combat skills, the military has sometimes used civilian training institutions to provide individual training.

The military also recognizes special issues related to individual training in the RC. These special RC needs generally fall into one of three major areas: (a) job skill enhancement (i.e., computer operator), (b) regular academic or technical programs directly corresponding to a military skill (i.e., Licensed Practical Nurse), and (c) specific military skills that civilian providers, such as community colleges, have the resources to design and develop as special offerings (i.e., military surveying), (Watt, 1988).

Existing Civilian/Military Programs

The military services have established several avenues that can be used to obtain military training from civilian institutions. The Navy's CIVTRAIN program is a database that lists colleges and technical institutes that can be used to provide selected occupational training to reservists in a limited geographical area.

The Army's Forces Command/Training and Doctrine Command (FORSCOM/TRADOC) Regulation 135-3 contains a list of occupational specialty skills that are considered appropriate for civilians to train under contract to the Army (contract training) (Watt, 1988). These 53 MOSs are listed in Table 31.

Table 31
Extract FORSCOM/TRADOC Regulation 135-3*

[illegible]	[illegible]
29M	Tactical Microwave Systems Repairer
26Q	Tactical Satellite/Microwave Systems Operator
26T	Radio/Television Systems Specialist
29E	Field Radio Repairer
29J	Teletypewriter Repairer
31V	Tactical Communications System Operator/Mechanic
35B	Electronic Instrument Repairer
39E	Special Electrical Devices Repairer
35H	Calibration Specialist
35K	Avionics Mechanic
36E	Cable Splicer
41B	Topographic Instrument Repair Specialist
41E	Audiovisual Equipment Repairer
41J	Office Machine Repairer
41K	Reproduction Equipment Repair Specialist
44B	Metal Worker
44E	Machinist
51B	Carpentry and Masonry Specialist
51C	Structures Specialist
51G	Materials Quality Specialist
51M	Firefighter
51N	Water Treatment and Plumbing Systems Specialist
51R	Electrician
52C	Utilities Equipment Repairer
52E	Prime Power Production Specialist
53B	Industrial Gas Production Specialist
62G	Quarry Specialist
62H	Concrete and Asphalt Equipment Operator
68B	Aircraft Power Plant Repairer
68F	Aircraft Electrician
68G	Aircraft Structural Repairer
68H	Aircraft Pneudraulic Repairer
71E	Court Reporter
71R	Broadcast Journalist
74B	Card and Tape Writer
74D	Computer/Machine Operator
81B	Technical Drafting Specialist
81C	Cartographer
81E	Illustrator
82B	Construction Surveyor
82D	Topographic Surveyor
83E	Photo and Layout Specialist
83F	Photolithographer
84B	Still Photographic Specialist
84C	Motion Picture Specialist
84F	Audio/Television Specialist
91C	Practical Nurse
92B	Medical Laboratory Specialist (Basic & Advanced)
92C	Petroleum Lab Specialist
92D	Chemical Lab Specialist
92E	Meteorological Observer
93F	Field Artillery Meteorological Crewman
94B	Food Services Specialist

*Watt, 1988

The 53 MOSs approved for contract training were compared to the course and program descriptions listed in the course catalogs from the three community colleges that participated in the FTP. It was determined from this comparison that 16 of these MOSs have some relationship to courses or programs currently listed in the community colleges' catalogs. Table 32 lists these 16 MOSs and classifies the instruction available at the community college as either a course(s) or complete associate degree program(s).

Although the table lists the programs and courses where there is a similarity of content, there was no in-depth content analysis to determine the exactness of the match between the military and community college content. It is unclear whether the content of the community college programs and courses is close enough to provide certification in the Army MOSs. This table shows that a course or program of this type is available from one of the community colleges who participated in this project, but it does not specify which one. Objective C5 addresses which community college courses are available with content similar to the VTT course taught in the FTP.

Table 32
Relationship Between TRADOC Approved Contract Training and FTP Community College Curricula

[illegible]	Courses	Programs
26T Radio/Television Systems Specialist	Yes	Yes
35B Electronic Instrument Repairer	Yes	Yes
35K Avionics Mechanic	Yes	No
44B Metal Worker	Yes	No
51B Carpentry and Masonry Specialist	Yes	Yes
51G Materials Quality Specialist	Yes	No
51M Firefighter	Yes	Yes
51N Water Treatment and Plumbing Systems Specialist	Yes	No
51R Electrician	Yes	No
68G Aircraft Structural Repairer	Yes	No
74D Computer/Machine Operator	Yes	Yes
81B Technical Drafting Specialist	Yes	Yes
83E Photo and Layout Specialist	Yes	No
91C Practical Nurse	Yes	Yes
92B Medical Laboratory Specialist	Yes	Yes
94B Food Service Specialist	Yes	No

In summary, only individual rather than collective tasks can be trained by civilian institutions. Of the 53 MOSs listed as appropriate for civilian contract training by FORSCOM/TRADOC Regulation 135-3, only 16 of these are available as courses or programs at one or more of the three Florida community colleges that participated in this study. Interestingly, none of the MOSs taught during the FTP are listed in FORSCOM/TRADOC Regulation 135-3, and therefore these MOS courses (i.e., 71L10, 76Y10, 95B10) were not addressed in the comparison table (Table 32). However, extensive criminal justice programs exist at both FCCJ and SPJC. Basic Military Police (95B10) was selected to be taught during this project in part because of existence of these programs.

Objective C5
Determine the Match Between Selected Military Courses and Standard Community College Offerings and if Completion of Military Courses Can Result in Community College Credit

The purpose of this objective was to determine the fit between the military courses selected for the pilot test and the civilian courses found in the curriculum at the three community colleges. Community college administrative personnel who originally proposed the project considered this fit very important in encouraging student involvement, motivating students to achieve, and giving the classroom a college atmosphere. This objective also includes an investigation of two issues surrounding the award of college credit: (a) whether credit can be given for military courses taken at a community college, and (b) the importance of college credit to students.

Although the MOS courses chosen for the FTP are not contained in the list of courses approved for contract training found in FORSCOM/TRADOC Regulation 135-3 (see Objective C4), the courses were selected by DITRA based on the recommendations of the FLARNG and the 81st ARCOM. The FLARNG and the 81st ARCOM selected the courses partly based on the expected throughput for the training year. The courses were selected by DITRA and later analyzed by the FTP and were appropriate for VTT (see Objective A4).

Course Content Analysis

Initially, the military and community college courses were compared to determine the extent of overlap between them. These comparisons were made by analyzing course descriptions found in the three community college catalogs and comparing them to the content presented in the five VTT courses. For example, in the 71L10 course, each college has an introductory course in keyboarding or beginning typewriting that could contain content that is also presented in the military VTT course. In contrast, the TQL course lacked overlap with any course offered by the three community colleges. This comparison formed the basis for determining whether or not college credit could be given to students for the five military courses.

Community College Credit

The Guide to the Evaluation of Educational Experiences in the Armed Services (American Council on Education, 1988) is a standard reference work for establishing credit for learning acquired in the military. *The Guide* recommends both college and vocational credit. However, these recommendations are based on both classroom and experiential learning. Therefore, certification in skill level 10 is only part of the knowledge that a service member will gain during his or her performance of their occupational duties. This means that the material covered in the VTT versions of the three Army MOS courses does not reflect the full scope of experiential learning upon which *The Guide's* recommendation is based. For example, 76Y10 and 95B10 include both IDT and ADT phases and the VTT courses addressed only the IDT phase.

The 1988 *Guide* recommends awarding the following college credit for the three Army MOS courses:

71L10: Administrative Specialist

Vocational certificate or lower-division baccalaureate/associate degree category

- 2 semester hours in typing
- 2 semester hours in recordkeeping
- 1 semester hour in business communications
- 3 semester hours in office procedures

76Y10: Unit Supply Specialist

Vocational certificate or lower-division baccalaureate/associate degree category

- 3 semester hours in recordkeeping
- 3 semester hours in office procedures
- 2 semester hours in office machines
- 1 semester hour in typing

95B10: Basic Military Police

Lower-division baccalaureate/associate degree category

- 3 semester hours in patrol operations

Determining Credit for FTP Courses. The Instructional Manger at FCCJ coordinated the efforts of the community college network to provide college credit for the military courses offered in the project. The community colleges faced several difficult challenges in their attempt to standardize the credit issued by each college for the respective military courses.

In the state of Florida, each community college is governed by a separate board of trustees. This allows each college the freedom to create an organizational structure and develop a curriculum that is most responsive to the community it serves. Each community college in the state of Florida follows a common course numbering system. This system provides a degree of curriculum standardization among the state supported community colleges. However, due to the differing organizational structures and variations in curricula, the same college credit was not awarded at each of the community college sites.

There were no equivalent college courses in the state common course numbering system for 76Y10, HazWaste, and TQL. In addition, instructional content for the military courses selected for the project usually contained only partial content from several community college courses and did not fully cover the content in any single course. In 76Y10, for example, the topics addressed did not sufficiently cover enough standard community college course content

to award college credit. In these cases the students were given non-degree earning special topics and continuing education credits (CEC).

In 71L10, it was possible to substitute military correspondence style and production typing for other topics normally covered in the standard curriculum and award college credit. College credit was awarded in the 95B10 course along with additional CECs that were useful to RC students working in the security and law enforcement fields. Table 33 shows the type and amount of credit granted by each participating community college for each course. As shown in the table, students participating in the project at different institutions received different amounts of college credit.

Table 33
College Credit Awarded for Military VTT Courses

VTT Course	FCCJ	SPJC	VCC
71L10	OST 1100, Keyboarding (3 College Credits) BED 0570 Administrative Specialist (non-credit)	OST 1100 Keyboarding I (3 College Credits) OST 1321 Automated Office Skills (2 College Credits) BUS 400 Administrative Specialist Training (non-credit)	OST 1100 Keyboarding I (3 College Credits) 999 Office Systems Technology: Selected Topics (non-credit)
76Y10	BED 0650 Unit Supply Specialists (non-credit)	BUS 0448, Record Keeping (non-credit) OST 1321 Automated Office Skills (non-credit)	443 Career Skills Development: Selected Topics (non-credit)
95B10	CJT 2930 Special Topics/Seminars in Criminology (3 College Credits) PSR 0200 Basic Law Enforcement (non-credit) PSR 0242 Military Police (non-credit)	CCJ 2990 Introduction to Criminal Justice for Military Police (3 College Credits) FLE 1781 Introduction to Criminal Justice for Military Police (non-credit)	CCJ 2930 Criminal Justice: Selected Topics (3 College Credits) 805 Police Tactical Response (non-credit)
HAZ	PSR 0840 Handling Hazardous Waste (non-credit)	TEL 698 Hazardous Materials and Waste Management (non-credit)	918, Hazardous Waste (non-credit)
TQL	BED 0071 Introduction to Quality Leadership (non-credit)	BUS 466 Total Quality Leadership (non-credit)	674 Management: Selected Topics (non-credit)

Student Responses

While it was advantageous for the community colleges to award college credit, and it was assumed that students would want college credit, students in the three Army MOS courses were asked how important the college credit was to them. They were asked to respond on a 3-point scale from *very important* (3) to *not important* (1). The students tended to respond differently depending upon whether they were enrolled or planning to enroll in a college program. Student responses are shown in Table 34 and were categorized by whether students were enrolled in college or not. (Students in the HazWaste and TQL courses were not asked this question).

Table 34
Importance of College Credit to Students

Course	All Students $\bar{X}$ (SD) N	Students in College Programs $\bar{X}$ (SD) N	Students Not in College Programs $\bar{X}$ (SD) N
71L10	1.94 (.83) 33	1.96 (.82) 23	1.90 (.88) 10
76Y10	1.64 (.87) 40	1.74 (.90) 35	1.00 (.00) 5
95B10	2.12 (.77) 27	2.17 (.78) 24	1.67 (.58) 3

As shown in the table, the students enrolled in or planning to enroll in college programs tended to rate the importance of college credit somewhat higher than those students who were not planning to continue their education. With the exception of the 76Y10 students who were not enrolled in college ($\bar{X}$ = 1.00), all of the other students stated that college credit was at least moderately important to them.

In summary, there were many areas where there was some content overlap between the military courses selected for the FTP and the standard course offerings of the three community colleges involved in the project. In areas where the content was heavily military, there was not sufficient overlap to award standard community college credit. In these cases, the community colleges awarded CECs or a mix of CECs and degree earning credit. The same college credit was not uniformly awarded across the community colleges. In short, the match between the military courses and the standard community college course offerings varied among courses and across institutions, but it was possible to award some form of college credit, either standard community college or continuing education, for completion of the military courses. Military students, especially those already enrolled in college programs, typically want college credit awarded whenever it is possible.

Objective C6
Determine the Community Colleges' Level of Cooperation and Support for Delivery of VTT Courses, and Discuss Their Future Effectiveness in Providing a VTT Approach to Military Instruction

One of the primary goals of the FTP was to determine the feasibility of community colleges offering military courses by teletraining. Support from and among the community colleges was critical to the success of this project, and likewise, to any future venture between the military and community colleges. This objective examines the level of community college cooperation required to successfully design, develop, and deliver effective VTT instruction.

Contractual Relationships

SPJC and VCC were selected as remote TNET sites because they were located in regions containing a large number of the desired training population at the time of course selection. They then became subcontractors to FCCJ in order to accomplish this pilot study. Under the terms of these contracts, SPJC and VCC agreed to provide the following:

- access to, and use of a designated classroom capable of housing the TNET equipment and 15 students
- staff support and instructional management services
    - a content qualified IC to distribute and collect course materials, to oversee and monitor evaluations and tests, and to collect project evaluation data
    - an instructional management supervisor/POC to handle administrative requirements
    - technical personnel to perform the minimal equipment maintenance
- ancillary resources, equipment, laboratories, and all other required facilities, including typewriters, VCR's, and microfiche readers
- student services as customarily covered by registration fees.

The interactions between the community colleges were effective due in part to comprehensiveness of the subcontracts and to the staff training that was conducted (see Objective C3). A specific training workshop was held with the explicit purpose of insuring that all personnel: (a) knew their roles and responsibilities and (b) had the chance to get acquainted prior to delivery of the instruction. In addition, practice sessions, designed for the same purposes, were conducted over the network for instructional and technical support personnel.

Administrative Personnel

A number of community college personnel were needed to facilitate the interaction between community colleges and to participate in the design, development and delivery of the courses. A logistics manager at FCCJ was responsible for monitoring the contracts between the community colleges. The task of formulating and administering the contracts was time consuming, but essential. The logistics manager communicated with administrative POCs located at SPJC and VCC. The POCs were responsible for overseeing and coordinating the project activities at each community college in agreement with the FCCJ subcontract. The out-of-state sites, that were not at community colleges, did not have this contact and were not as well prepared and organized for course delivery.

FCCJ stated that it was very important to the success of the project to have top level administrative support, i.e., from the Presidents of the respective institutions. These administrators of the Florida community colleges meet together regularly. Their knowledge of and support for the project was a factor in its success.

Course Credit

One of the most challenging administrative problems was locating individuals on the campus with the authority to create a means of awarding college credit for the military training course. Despite the variety of college course offerings, creating an appropriate credit for the VTT course was difficult, as discussed in Objective C5. In some cases, administrators found little or no connection with existing courses or academic departments. Credit arrangements with the community colleges were made by the Instructional Manager at the origination site.

Each college did provide the services and benefits expected by tuition-paying students. For example, students had to register for the classes, and class and student records were maintained by the colleges. Students were also provided access to academic advisement and remediation.

Financial Details

It was important for the community colleges who participated in the FTP to pay their own expenses and break even when the project was completed. In exchange for providing special services for the FTP, the community colleges charged a contractually fixed fee per course that was paid out of project funding. This charge included room, support facilities, and services. In addition, the tuition charge for each student was paid out of project funds.

In examining the benefits to the community colleges, the remote sites received money that covered the salaries of the ICs as well as any support staff needed to complete this project. This funding was in addition to the tuition costs and costs for materials. The instructional staff also received training from FTP personnel on how to conduct VTT and how to use the VTT equipment. Substitute teachers were also hired out of project funds to replace the teachers needed as instructors at the origination site.

In conclusion, community colleges have a history of working together. If VTT is considered a viable option to meet certain DoD training needs, the community colleges that participated in the FTP have demonstrated that they can and will establish networks to deliver instruction via distance learning. While administratively difficult, the community colleges in the FTP were willing and able to grant college credit for military courses.

Objective C7
Identify Key Organizational/Management Issues Facing Community Colleges in Implementing a VTT-Based Approach to Military Instruction

The purpose of this objective was to determine the organizational and managerial factors that influenced how successful the community colleges were in implementing military courses using TNET. There is no specific data that can be reported for this objective. Rather, the issues identified by the project management teams at FCCJ and IST were the primary inputs for this objective. The major issues identified were: contractor/subcontractor relationships, project evaluation, and community college and military coordination.

Contractor/Subcontractor Relationships

The contractor/subcontractor relationships in this project were multi-layered. DITRA contracted with IST to serve as the prime contractor for the project and to provide technical, administrative, and managerial assistance to FCCJ who was the anchor community college and prime subcontractor. FCCJ, in turn, had two primary responsibilities: (a) to coordinate the efforts of the remote sites with the two other community colleges and (b) to design, develop, and implement the VTT courses.

The government agency originally responsible for conducting the FTP was TPDC. This office, located in the same city as the prime contractor, was closed two-thirds of the way through the project. DITRA became the government agency responsible for overseeing completion of the project. While this change did not cause undue hardship, having TPDC in the same city as the prime contractor was convenient for coordinating project-related efforts and having face-to-face meetings. In addition, the change of government agencies meant that the new agency initially had a limited context for the project.

The contractor and subcontractors were also located in different cities. While distance was a relatively minor issue in these relationships, face-to-face meetings between the project teams at the university and community college and among the community colleges required travel.

The relationships among the three community colleges that participated in this project were established through subcontracts. These relationships were previously discussed in Objective C6 and are not repeated here. Some of the key issues that the community colleges had to contend with were identifying and hiring personnel, assigning college credit, and coordinating project activities.

Some aspects of the contractual relationships that should be considered when conducting a large project are:

- It is important for any organization participating in a project such as the FTP to obtain information in a timely fashion. In large projects, there are several levels

of management and administration; an inadequate information flow of information can adversely affect decision making about important project tasks. Care should be taken to insure that all participants get the information they need at the time they need it.

- It is important for the prime contractor to have experience in administering a large government contract.

- There is a major discrepancy between an academic schedule and a non-academic schedule. The government works on a 12-month, 5-day a week calendar rather than a 9-month academic calendar. Holiday schedules and summer vacations are not the same. The difference in these schedules caused coordination problems that were not always easy to rectify. Generally, community college personnel adjusted their schedules to meet the contracted deadlines. However, it is important to keep in mind that when university or community college faculty work with organizations that operate on a 12-month calendar, coordination is essential and tension and friction can occur.

- No organization will have complete expertise or knowledge about any project. In fact, one reason several organizations are involved in large projects is to capitalize on their differing strengths. As contractors and subcontractors try to influence each other in their areas of expertise, resistance can occur. This is especially true when one group or the other believes that their expertise is equal to that of another group. Understanding who has knowledge or lack of it is important to project success and completion. Issues concerning expertise can lead to questions about who should be the prime contractor and who should be the subcontractor.

- The contractor/subcontractor relationship can be further complicated by issues of credibility. Because the prime contractor is ultimately responsible for performing the contracted tasks, the prime can apply too much control. If this control is perceived by the subcontractor as due to lack of credibility, it can take a toll on morale. Such a situation should be avoided because it can damage an otherwise good working relationship between organizations and/or individuals.

Even though there were issues that arose from the contractor/subcontractor relationship, each group had strengths that were needed to complete the project. For example, experience in distance education, ISD, project evaluation, military course delivery, computer expertise, technical expertise about course production, delivery, and TNET, and proficiency in teaching were necessary. The organization of the roles and responsibilities of each group is an important management task that had to be planned.

Project Evaluation

The prime contractor was responsible for conducting the project evaluation and was also responsible for administering the contract and providing technical expertise to the subcontractor

in the areas of distance education, instructional design and course development, and military instruction. While these multiple roles could have been viewed as potential areas of conflict, the contractor had expertise in evaluation. Performing multiple project roles is cost effective. However, contracting part of the evaluation component to outside evaluators was used to minimize potential conflict of interest.

Community College and Military Coordination

The success of the FTP was in large measure a function of the ability of the community college and military to work together. There were some major challenges that existed for the community college faculty and personnel in their efforts to present military instruction via VTT:

- the ability of the community college faculty to deal with the military culture
- issues surrounding the assignment of SMEs and the expertise of the SMEs
- establishing a relationship between the anchor community college and the proponent schools
- obtaining students for the courses
- obtaining military course support materials for the project.

Military Culture. In order to successfully complete the project it was necessary for the civilian employees of the community college to understand the military culture, rank structure, training methodology, and organizational hierarchy. Since the project was performed under a contract with DoD it was necessary for the community college personnel to accommodate the military by including leaders from the major military commands (US 2nd Army, FLARNG, 81st ARCOM, etc.), the proponent schools, and the local USARF schools in planning and executing of the project. In addition, the community college personnel had to learn military technical terms and a myriad of acronyms.

The community colleges, with assistance from DITRA and the prime contractor, were able to successfully adapt to the military structure. DITRA assisted the community college by working with the various commands that needed to coordinate with the college. The prime contractor provided a military training specialist who worked with the community college Instructional Manager and the course developers to provide training and context for the military aspects of the course conversion.

SME Issues. In order to deal with the military content, a SME was assigned to work with each community college course developer. This conversion process required thorough and precise presentation of content to insure that the personnel who competed the courses would be able to perform their duties under wartime conditions and to be certified for the MOS. It was essential for the SME to have a high degree of knowledge in the content area and to be able to work cooperatively with the community college course developer.

To ensure that SME had the knowledge and level of cooperation needed for successful adaptation of the courseware, the duties and responsibilities of the SMEs were clarified during an in-progress-review (IPR) in February of 1992. Representatives of the entire chain of command for the SMEs were present at this IPR and agreed to the duties and responsibilities.

The SMEs for the Army MOS courses were qualified USARF instructors provided by the 3391st USARF School, in Jacksonville, Florida. The SMEs were experts in the delivery of the proponent school RC^3 materials, not in the development of instructional materials. Due to: (a) the long chain of command between the Office of the Assistant Secretary of Defense (OASD), TPDC and the 3391st USARF school, (b) funding issues (funds to pay and allowances for the SMEs were provided by the U.S. 2nd Army) and (c) the process for obtaining military orders, the first SME was not assigned until three months into the time allotted for course reconfiguration. This caused considerable problems for the community college course developers.

In addition, since the Army MOS course SMEs were reservists on drill status, it was difficult to obtain them for more than 16 hours per month to help with the reconfiguration process. This amount of time proved inadequate to provide the level of assistance needed by the course developers. The 16 hour limitation occurred because the additional funds provided to the 81st ARCOM for assisting in the FTP were only sufficient to cover this amount of time.

Another difficulty with scheduling the SME's time was that as drilling reservists, they had to perform their military duties in addition to civilian jobs and family responsibilities. Two of the SMEs (one Army and one Navy) lived in cities other than Jacksonville, making consultation and communication difficult and time consuming.

Relationship between the community college and the proponent schools. In order to provide a mechanism for official service approval of the courses, it was necessary to establish formal POCs with all of the proponent schools. To accomplish this, DITRA made initial, high level contacts with the schools. From these contacts, introductory working level meetings were held to define procedures for approval of courseware and to determine other project support that would be provided by the proponent school. Once this initial contact between the community college Instructional Manager and the proponent schools had been established, another delay of several weeks occurred due to the time it took to build working relationships and to formalize the course approval process. Since direct contact with the proponent schools was necessary to obtain approval for the Army MOS courses, these delays were problematic.

Coordination between the anchor community college and the proponent schools (and other military agencies, e.g., AETD) was accomplished through a formal Memorandum of Understanding (MOU) and an informal memorandum of approval that accompanied each instructional unit sent to the school for review. Final proponent school approval for the complete courseware package was sent to community college Instructional Manager by the proponent, through DITRA.

Obtaining students. Direct coordination with military commands responsible for generating orders for students to attend the courses was a function handled by DITRA. The orders process was a source of frustration for the community colleges throughout the course

delivery phase. Student orders were sometimes published only one or two days prior to the start of a course; some students with orders never reported to the community colleges and some students arrived at the community colleges with orders too short to allow them to attend the full course. These issued were resolved by the military commands within the first three days of the MOS courses.

Obtaining military course support materials. Obtaining the ancillary course support materials (Army manuals, regulations, etc) proved to be a problem given the time constraints caused by the project's delivery schec ɹle. Army regulations specify a routine established procedure for civilians to obtain materials in support of government contracts. This standard procedure proved to be inadequate to meet the short time frames of the project. However, with DITRA's assistance, provisions were made for the FTP to get special priority. Without this priority, obtaining the materials and forms would have been a significant problem.

In summary, the organizational and managerial issues that were identified revolved primarily around: (a) the roles of the prime contractor and the subcontractor and (b) military coordination with the community colleges. To summarize this objective, the civilian and military organizations that participated in this project worked together to design, develop, produce, and deliver high quality instruction to military students. In view of the size of the project, there were few problems and issues that were not easily resolved. Many of the civilians and military involved in the project suggested that it was a win-win situation for everyone. Some of the key issues and lesson learned from the FTP were:

- Success depends on the availability of military support to the community college, including SMEs, the satellite system, proponent school support, and sufficient students for classes.
- Professional instructional designers are needed to work with community college faculty.
- Clear designations of roles and responsibilities for all project personnel are required.
- Sufficient funding and lead time are needed to design and deliver the courses.
- Ways to reconcile differences in scheduling based on an academic vs. government calendar are necessary.
- Informal as well as formal mechanisms for interaction among agencies and institutions are needed.

Conclusions about the Community Colleges

Part of the missions of the community colleges in Florida is outreach to special segments and groups within the community. Military students are part of the community and as such can expect community colleges to be providers of military training. Florida's community colleges are networked both formally and informally; they can and do work together regularly.

Because community colleges strive to meet the needs of their respective constituencies, they have varying instructional and technical resources. For this project, only FCCJ had the technical studio capabilities to produce the instruction, but each college had the technical personnel, space requirements, and support equipment that were needed to successfully implement the instruction.

There were different instructional requirements for the origination site and for the remote sites. Since the faculty at the origination site were designing, developing, and implementing the instruction, it was necessary for them to be excellent teachers, be knowledgeable about distance learning, have good ISD or course development skills, and understand aspects of military training. The origination site faculty were excellent teachers, but needed training in distance education, reconfiguring military courses, and ISD. These were provided and the faculty were able to deliver good courses. The remote site faculty needed context for the project, but since they did not develop or implement the courses, they did not need training in many aspects of the project that were required for the origination site faculty. However, it can be assumed that any community college faculty would need training in implementing a VTT approach. It can also be assumed that as professional educators, a comprehensive staff development program can alleviate any lack of capability that community college faculty have regarding their VTT roles.

The staff training that was provided by the FTP was evaluated as very helpful and prepared the community college with the skills necessary to perform their roles and responsibilities. While extensive training was provided about TNET, the non-technical community college faculty never felt fully prepared to operate the system (even though they were never expected to operate TNET without the assistance of a trained technician).

The community colleges were able to offer academic and continuing education credit for all five VTT courses. Even though the Army has identified 53 MOSs that can be trained by civilian institutions, none of the MOS courses presented by the FTP were among those listed. Still, the community colleges presented the instruction and granted credit. The credit given was not standard across the three colleges because of their individualized curricula. While the college courses and the military offerings were "made to fit" (that is, continuing credit was offered), there was not a one-to-one correspondence between community college courses and military courses. However, the students were very favorably disposed to receiving college credit and it was worth the effort of the community colleges to provide it.

The community colleges in this project were organized through subcontracts where FCCJ was the prime contractor and VCC and SPJC were the subcontractors. This proved to be an effective way for the community colleges to work together. Likewise, formal contracts and

MOAs were established between IST and FCCJ, and between FCCJ and a variety of military agencies, e.g., AETD. While there were some problems and differences of opinion regarding decision making and the course development process, all institutions involved worked together and delivered high quality instruction to military students.

Issues

It is essential to have qualified and experienced technical and instructional personnel working on a project of this magnitude. Only one of the community colleges in the FTP had the technical capabilities necessary to be the origination site. If community colleges are to be providers of military training using a VTT system, at least one site must have the studio capabilities and have the experienced personnel to be able to present the instruction.

Some observers, both civilian and military, staff and students, believed the VTT instructor should not be civilian. They concluded there were too many questions only someone in the military could address. Program designers expected the military to send complete POIs or syllabi to be modified for delivery, but this was not always the case. The instructor for 76Y10 complained that in some cases he was not sent any lecture materials; he and the military SME were required to create the course "from scratch." Without content expertise, military experience, and adequate course POIs, redesigning and teaching military courses is a difficult task.

A lack of military background occasionally led an instructor to lose credibility with the students. This experience gap was most obvious for classes where there were MOS experienced students. Often members of the class knew more about the course material than did the instructor. The 76Y10 instructors even found that the experienced students were a valuable resource for other students in the course. Still, it should be noted that military and instructional coordinators usually worked very well together. In doing so, they provided the most visible and positive balance of military and college initiatives. An issue though is whether civilians should provide military instruction when their content background and military experience is limited. The civilian educators did, however, bring other important capabilities to the project, and each project must weigh the pros and cons of using civilians to teach military students.

There was redundancy of skills at the remote sites for the MOS courses. Each course had a community college representative and a military representative and both were needed so that students could receive credit and could be MOS qualified. This was inefficient. In future endeavors where the community college and military are going to team together, how the IC and MSC roles can be combined or interchanged should be examined to eliminate redundancy.

Perhaps the predominate issue related to staff training revolves around selecting versus training personnel. The FTP decided to select community college professors who had content and subject matter expertise wherever possible rather than course development (ISD) expertise. However, since the courses had considerable military content requirements, even the instructors' content expertise was not sufficient. The lack of ISD skills, military content expertise, and TNET background made the staff training requirements significant.

Another option would have been to separate the course design responsibilities from the course delivery responsibilities (e.g., hire course developers and military SMEs to design and develop the courses and another group to implement the courses). However, few community college instructors have formal ISD skills. While this option may have alleviated the need for training in course development, any on-camera teacher, civilian or military, will still need technical and instructional training.

Each project should carefully consider the training versus selection issue. A key decision will be to determine which skills are easiest or best to provide training for and which skills should personnel possess when they are selected to perform certain roles.

The instructional personnel stated that they needed more practice with the technology. An issue is how much additional training would be enough. People who fear technology may never be comfortable with complex systems. Some questions to consider are what kinds of options for additional training and/or for additional help are available, e.g., would more OJT be sufficient.

In addition, the course developers stated that they needed more practice and corrective feedback during the course development process. While better prepared materials from the proponent schools would have helped, an opportunity for the VTT instructors to attend a proponent school course would have been very helpful. Although this was considered, attendance was not possible because the courses were not offered during the time frame of the FTP.

The military services have made provisions for civilian institutions to provide military occupational training on a limited basis. There is no evidence to suggest that these efforts have resulted in system-wide adoption of civilian institutions as trainers of the military services. Although the military has identified areas where civilians can provide military training, it is unclear if the military training requirements for these areas could be met with one course or whether an entire program is needed to train the service members to the standards set by the proponent schools.

Courses can be successfully taught by civilian institutions even though they have not been designated as appropriate for civilian contract training by FORSCOM/TRADOC Regulation 135-3. Creating a standard curriculum for community colleges operating a network designed for delivering instruction to the military would enable the colleges to standardize the type and amount of credit received for the successful completion of military courses taken at civilian institutions.

College credit can be issued for military courses taken at a community college, but community colleges that are funded with state tax dollars receive more full time student equivalent (FTE) dollars to deliver credit rather than non-credit classes. There is usually a substantial difference in the amount of tuition paid by the student; colleges must collect a fee that includes all the expenses of curriculum development, design, and delivery. In short, community colleges must recoup all their costs to offer customized non-college credit courses. Therefore,

it would be more cost effective for the community colleges to deliver standardized, college credit courses than to design new courses.

A customized associate degree program with standardized credits for specific military courses would simplify issuing credit for military courses taken through community colleges. This could be done by designating a nationwide community college network for delivering VTT instruction. However, if uniformity of college credit is desired by the military, the community colleges will need to negotiate among themselves to provide this service to the military.

Community colleges can offer benefits to students that traditional military instructional organizations are unable to provide, e.g., college credit, library facilities, and advising. Plus, community colleges can form teaching-learning networks that may be beneficial. For example, if community colleges could maintain standard and consistent training across locations, then as military students are reassigned to new locations they could continue their training without losing time or resources. If this is perceived as a benefit to the DoD, then the ability of the community colleges to provide military instruction must be seen as an advantage.

Finally, there were multiple roles to be performed in a project of this size and magnitude. How the roles are defined and implemented and who wields ultimate power plays an important part in the success of the project. The specific expertise of project participants in relationship to their assigned roles and responsibilities needs to be carefully outlined and understood.

Regarding the relationships between the community colleges and military organizations, an individual familiar with military training and procedures should be readily available to the community college staff to facilitate civilian-military cooperation and advise the community college staff in military matters. For example, more proponent school support was needed for community colleges in developing military VTT courseware. This support could come in the form of SMEs familiar with technical content and having previous course development experience. Contacts between the proponent schools and the community colleges need to be established early in the project. In addition, the SMEs must be readily available for course development. The FCCJ Instructional Manager estimated that reconfiguration for a two week course required from 32 to 40 hours of SME time per month during the development phase. Sufficient funding for the necessary SME time must be provided in future VTT reconfiguration efforts.

How formal or informal these roles and responsibilities need to be among agencies is probably as dependent on the personalities of the people involved in a project as it is a function of the contractual relationships. It is possible that internal civilian coordination and civilian/military coordination could be improved by the use of a MOU between a network of community colleges and military commands. The MOU could become the basic working document and should detail the roles and responsibilities of the community college network as well as the military organization (Watt, 1988). It is doubtful, however, that any formal agreement could address all the issues that will arise in the course of a large project such as the FTP. It is therefore of utmost importance to have groups who are willing participants and to have people in administrative positions that have as their first priority the education of the military students.

OBJECTIVES RELATED TO COSTS

The purpose of the cost analysis was to address four objectives by answering the following research questions:

- What was the cost of conducting the pilot test?
- What was the cost of designing, developing, and implementing each course?
- What was the total, non-experimental cost of each course?
- What was the non-experimental cost of each course per student?
- What was the non-experimental cost of delivery per hour of instruction for each course?
- What was the cost of each graphic used in the each course?
- How do the non-experimental costs per student compare to the estimated costs of traditional military training?
- Was the VTT delivered by community colleges cost effective compared to traditional military training?

Methodology

Procedure

The costs associated with the project were collected and categorized. The sources of cost data were IST, FCCJ, VCC, and SPJC. Costs for the prime contractor and all subcontractors were obtained by examining the actual billings. Each item from the monthly billings was examined to determine its relationship to the phases outlined in the SAT. The items were also categorized according to whether they related to the operation of a remote classroom site or to the administration of the pilot project (as opposed to the operation of an on-going VTT network). Each item was then charged to a specific course or courses and classified into: (a) one of the five conventional costing areas: personnel, equipment, supplies, contracts, or travel, (b) to course administration.

The subcontracts with the participating community colleges called for the delivery of the instruction at a contractually negotiated fixed price per course, plus student registration and tuition fees. The registration and tuition fees represent the per student variable costs for each course.

Since the cost data were collected on the basis of the subcontractor billings to IST, some global decisions were made in order to deal with certain recurring charges in a consistent manner. The results of these decisions had some influence on the final cost results and this should be taken in to account when making judgements based on the cost data described in this report. Major decisions included:

- **Administration.** Administration costs not directly related to instruction (e.g., reporting requirements and management functions related to the contract with IST and administrative assistance in these matters) were divided equally among all courses since it was impossible to determine from the subcontractor billings the particular course or courses that were incurring the expense. The exception was 71L10, which incurred higher costs because of project startup activities. Upon completion of the delivery of a course and the subsequent revision of the courseware, administrative charges for a particular course were no longer made. This resulted in administrative costs being charged to the HazWaste and TQL courses for almost the entire length of the project since these courses were the last active courses. It also resulted in higher administrative charges to HazWaste and TQL during the closing months of the project since administrative costs remained roughly the same throughout the project.

  This procedure is consistent with the accepted practice of recognizing period costs (costs associated with research, development and administration) as expenses at the time they are incurred. While this practice may appear to be an arbitrary allocation of costs, other methods of allocating costs that were considered for use (equal distribution of administrative costs and prorating of administrative costs based on total course length) were equally arbitrary and more difficult to implement uniformly. The method chosen is supported by Gellein & Newman (1973).

- **Local/long distance telephone service and facsimile equipment.** Since it was contractually necessary for the project to pay all of its own costs, FCCJ charged the project for: (a) the installation and rental of telephone lines used exclusively for the project, (b) local and long distance telephone service, and (c) the monthly rental of a fax machine dedicated to the project. These costs were charged to all courses as outlined in the section on administrative costs.

- **Analysis of the existing courseware.** There was no job task analysis of the occupations associated with any of the five courses. Therefore, this phase of the project centered around an analysis of the existing course materials and their suitability for VTT. Most of this analysis was conducted in December 1991 and early January 1992. The charges in the Analyze category (from the SAT model) for all courses reflect the salaries and travel costs of IST and FCCJ personnel during this period.

- **Remote site costs.** The cost of leasing the TNET equipment for the remote sites was charged to each course on an equal basis; that is, each course was charged 1/5 of the total cost. While this is consistent with accepted accounting practices (Gellein & Newman, 1973), it does not reflect a cost that is representative of the number of days each course presented instruction over the system. Because lease of the TNET system included 24 hours a day satellite time, the cost of system rental for instructional days was the same as the cost for non-instructional days.

The project was not charged TNET rental for the two remote sites at Camp Fogarty and Ft Taylor Hardin because these sites had previously been installed for other military training. Therefore, the only remote site costs incurred by the project for these courses were the community college tuition fees, shipping of instructional materials, and travel costs for the IST personnel involved in the delivery and evaluation of the HazWaste and TQL courses presented at these sites.

Objective D1
Develop a Cost Model that Includes the Elements Necessary for Developing and Offering Teletraining Courses from Community Colleges

The cost model used for the cost analysis was adapted from Bramble and Bauer (1991). The model used the components of the military SAT model that is used by the Army and that was adapted for use in this project. The cost model enabled the FTP to determine the total cost of producing all of the courses and the cost of producing a single course. The addition of the administrative cost category makes it possible to account for the costs associated with the overall administration of a pilot test (one-time experimental costs) as well as the operation of an established VTT network.

The cost model used in the FTP was:

$$Ci=\sum_{i=1}^{n} (ANi+DEi+DVi+DLi+EVi+Sum(SOji)+ADi)$$

The variables in this model are defined as follows:

- Ci = the total cost of course "i"
- ANi = the cost of analyzing course "i"
- DEi = the cost of designing course "i"
- DVi = the cost of developing course "i"
- DLi = the cost of delivering course "i"
- EVi = the cost of evaluating course "i"
- SOji = the cost of operating remote site "j" for course "i"
- ADi = administrative costs associated with course "i".

Objective D2
Determine the Cost of Each Course During the Pilot Test

The purpose of this objective was to determine the cost of conducting the pilot test including the costs of project evaluation and administration. Using the cost model, Table 35 was developed to present the total overall costs of the project. The costs are categorized by the five phases of the SAT model, the administration costs, the operating costs at each remote site, and the aggregate cost for all the remote sites.

Table 35
Cost of the Pilot Test

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ANALYZE	$1,315.07	$1,717.17	$1,315.07	$879.20	$471.66
DESIGN	$14,377.00	$12,326.97	$13,024.20	$10,273.06	$11,800.72
DEVELOPMENT	$155,846.43	$102,556.57	$113,916.09	$52,644.25	$51,076.78
TOTAL COST OF DEVELOPMENT	$171,538.50	$125,600.71	$128,255.36	$63,796.51	$63,399.16
DELIVERY	$29,551.70	$28,831.29	$29,157.47	$31,882.55	$31,290.91
EVALUATION	$32,516.76	$28,873.30	$27,896.97	$26,787.06	$29,087.83
ADMINISTRATION	$39,353.80	$37,870.75	$40,027.68	$43,187.52	$39,681.18
SITE COSTS:					
SPJC	$16,561.62	$15,443.39	$24,971.43	$24,230.35	$23,674.75
VCC	$16,279.39	$15,222.56	$24,840.52	$23,403.27	$23,298.03
FCCJ2	$14,183.96	$10,356.02	$18,160.96	$9,474.82	$9,404.02
FTH				$392.00	
FOG				$428.00	$316.00
TOTAL SITE COST	$47,024.97	$41,021.97	$67,972.91	$57,928.44	$56,692.80
TOTAL	$319,985.73	$253,198.02	$293,310.39	$223,582.08	$220,101.88

As shown in the table, the cost of conducting the pilot test for each course, whether it was a one-day or 10-day course, fall within a $100,000 range. This difference is due primarily to the IST and FCCJ administrative costs being uniformly distributed across the five courses, that is, the costs for conducting the pilot test were not proportional. Therefore, the cost of conducting a pilot test for a 10-day course is not ten times greater than the cost of conducting a pilot test for a one-day course.

Objective D3
Estimate the Costs of Course Design and Delivery that Would Result from an Operational, Rather than Experimental, VTT System

The purpose of this objective was to separate the cost of conducting the pilot test from the costs of developing and delivering the five FTP courses under the specific parameters of the project, e.g., the number of sites and students. Presented in this objective are: (a) the experimental and non-experimental costs for conducting each course, (b) the cost of VTT delivery per student, (c) the cost of delivery per instructional hour, (d) the cost per student hour, (e) the cost for design and development per hour of each course, (f) the costs of different tasks related to development of each course, e.g., word processing and graphics, and (g) a projection of the cost of producing a course given certain parameters.

Experimental vs. Non-Experimental Costs

One-time experimental costs were defined as costs associated with the maintenance and dual management of the instructional design and development functions at both IST and FCCJ. Typical examples of these costs were the salaries of project managers at both IST and FCCJ and of an instructional designer at IST to review and approve the course development that was subcontracted to FCCJ. In an on-going VTT system, external project administration might not exist or might not be as extensive. These one-time experimental costs were subtracted from the total cost of the pilot test. Table 36 shows the experimental costs associated with each phase of the project.

Table 36
Experimental Costs

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ANALYZE	$1,315.07	$1,315.07	$1,315.07	$879.20	$471.66
DESIGN	$2,797.67	$2,979.77	$3,669.90	$482.96	$789.14
DEVELOPMENT	$47,269.95	$23,322.46	$24,229.26	$4,581.30	$4,457.41
TOTAL COST OF DEVELOPMENT	$51,382.69	$27,617.30	$29,214.23	$5,943.46	$5,718.21
DELIVERY	$1,290.65	$1,070.46	$2,057.51	$2,439.21	$3,996.64
EVALUATION	$31,077.46	$26,777.09	$25,803.78	$24,731.56	$27,099.69
ADMINISTRATION	$17,368.00	$17,494.62	$17,208.48	$17,255.36	$14,591.06
TOTAL	$101,118.80	$72,959.47	$74,284.00	$50,369.59	$51,405.55

As previously stated, the 71L10 experimental costs are higher than the costs for the other two MOS courses of similar length because 71L10 was the first course developed. The 71L10 course was used as the prototype for designing the processes and products (e.g., forms) that were used during course design and approval. While these guidelines were later used for all the courses, the initial costs were charged to 71L10 because the guidelines were developed during this course.

The experimental costs were subtracted from the total costs of the courses to calculate the non-experimental costs of each course. These costs are shown in Table 37. Delivery refers to the origination site costs (FCCJ1) and the cost of producing the student and instructional personnel manuals. These costs were distributed equally across the courses as discussed in the Methodology section. The HazWaste and TQL courses, while less expensive to develop because they were one-day courses, were not proportionally less expensive overall because they were presented multiple times, thus increasing the student tuition costs at the remote sites.

Table 37
Non-Experimental Course Costs

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ANALYZE	$0.00	$402.10	$0.00	$0.00	$0.00
DESIGN	$11,579.33	$9,347.20	$9,354.30	$9,790.10	$11,011.58
DEVELOPMENT	$108,576.48	$79,234.11	$89,686.83	$48,062.95	$46,619.37
TOTAL COST OF DEVELOPMENT	$120,155.81	$88,983.41	$99,041.13	$57,853.05	$57,630.95
DELIVERY	$28,261.05	$27,760.83	$27,099.96	$29,443.34	$27,294.27
EVALUATION	$1,439.30	$2,096.21	$2,093.19	$2,055.50	$2,078.19
ADMINISTRATION	$21,985.80	$20,376.13	$22,819.20	$25,932.16	$25,090.12
SITE COST:					
SPJC	$16,561.62	$15,443.39	$24,971.43	$24,230.35	$23,674.75
VCC	$16,279.39	$15,222.56	$24,840.52	$23,403.27	$23,298.03
FCCJ2	$14,183.96	$10,356.02	$18,160.96	$9,474.82	$9,404.02
MONTGOMERY				$392.00	
FOG				$428.00	$316.00
TOTAL SITE COST	$47,024.97	$41,021.97	$67,972.91	$57,928.44	$56,692.80
TOTAL COST	$218,866.93	$180,238.55	$219,026.39	$173,212.49	$168,786.33

Analysis of the Non-Experimental Costs

In order to compare the costs of VTT courses presented at the community colleges with traditional methods of military instruction (these comparisons will be presented in Objective D4), a series of analyses were performed. These analyses break the non-experimental cost down according to the number of students, the cost per course delivery hour, the delivery cost per student hour, and the costs of different aspects of course development.

Cost of VTT Delivery per Student. In order to determine the per student cost of delivering the training, the total non-experimental delivery costs (see Table 37) were divided by the total number of students in each course. The non-experimental cost of delivery per student is shown in Table 38.

Table 38
Per Student Non-Experimental Cost of Delivery

[illegible]	[illegible]	[illegible]
71L10	33	$856.40
76Y10	40	$695.02
95B10	26	$1,042.30
HAZ	116	$253.82
TQL	60	$454.90

Because site operating costs remained stable relative to the student population at the site, the per student cost of delivery was influenced by the total number of students who took the course. While the delivery of VTT is more cost effective for large groups, having large classes may not be more instructionally effective. That is, the optimum class size is not dependent on economics alone. Educational considerations such as instructor to student ratio and the level of interactivity must be taken into account.

Cost of Delivery per Hour of Instruction. In order to determine the cost of the course per hour of instruction, the total non-experimental delivery cost was divided by the total number of instructional hours. These costs are presented in Table 39. The average cost of delivery per hour of instruction for all five VTT courses was $660.49.

Table 39
Non-Experimental Cost of Delivery per Instructional Hour

[illegible]	[illegible]	[illegible]
71L10	73	$387.14
76Y10	101	$274.86
95B10	66	$410.60
HAZ	8	$3,680.42
TQL	6	$4,549.05

As before, the site operating costs remained stable in relation to the amount of instruction delivered. Hence, the more hours of instruction delivered, the lower the cost per hour. This explains the relatively high cost of the two one-day special topics courses.

Delivery Cost per Student Hour. In order to determine if VTT will achieve an economy of scale (Dolan, 1977) relative to delivery cost per hour of instruction (i.e., will long range average costs decrease as the number of students increases), it was necessary to calculate the average delivery cost per student per hour of instruction. This amount was calculated by dividing the total non-experimental delivery cost by the total instructional hours multiplied by the total number of students (total non-experimental delivery cost/(total number of instructional hours x total number of students)). Table 40 shows the average delivery cost per student hour for each course.

Table 40
Cost of Delivery per Student Hour

[illegible]	[illegible]	[illegible]
71L10	73 (33)	$11.73
76Y10	101 (40)	$6.87
95B10	66 (26)	$16.27
HAZ	8 (116)	$31.72
TQL	6 (60)	$75.81

TQL was the most expensive course per student hour because the course was short (six instructional hours) and had only 60 students. Although there were more students in TQL than in the MOS courses, the length of the MOS courses made them less expensive per student hour.

Analyze, Design, and Development Costs per Instructional Hour. In order to provide a comparison between the reconfiguration of VTT courseware by the community college and the costs of traditionally developed courseware, the cost of analyzing, designing and developing each course per hour of instruction was calculated. For this analysis, the total non-experimental analysis, design, and development costs were divided by the total instructional hours. These costs are presented in Table 41.

Table 41
Analysis, Design and Development Costs per Hour

71L10	73	$1,645.97
76Y10	101	$881.02
95B10	66	$1,500.02
HAZ	8	$7,231.63
TQL	6	$9,605.16

The high costs of HazWaste and TQL were due to the fact that these were eight and six hour courses respectively. Therefore, the short courses were more expensive to develop per instructional hour. The relatively low cost of 76Y10 for analysis, design, and development per course hour is due to the fact that it had more hours than the other four courses.

Cost Analysis of Personnel Hours for Development of Courses. The development process can be broken down into tasks or functions that have to be completed for the courses to be delivered. For example, there were salaries for word processors, graphics designers, instructional designers, and the instructional manager. The number of hours required for each function and the salaries per hour were provided by the FCCJ Instructional Manager.

There were two phases of the course development process: initial development and revision of the courses after delivery. Both initial development and revision costs for the development tasks are presented in Tables 42 and 43. These costs do not include the cost of reproducing the final copies of the materials for distribution, nor the cost of shipping the materials to the remote sites. These costs were charged to the delivery phase instead of the development phase.

Table 42
Personnel Costs During Initial Course Development

71L10	$51,763.12	$12,904.73	$7,689.97	$15,353.90	$24,187.36
76Y10	$37,631.08	$9,387.75	$5,579.26	$11,158.52	$18,277.19
95B10	$43,875.22	$10,963.85	$6,507.00	$13,023.91	$20,640.17
HAZ	$22,267.64	$5,519.18	$3,297.62	$6,595.25	$15,730.24
TQL	$21,749.92	$5,434.60	$3,186.99	$6,448.90	$17,398.78

Table 43
Personnel Costs for Revision After VTT Course Delivery

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
71L10	$3,160.10	$2,439.16	$1,297.68	$961.25	$408.53
76Y10	$2,642.81	$2,037.72	$1,094.50	$800.85	$355.93
95B10	$1,525.23	$1,168.69	$625.60	$465.49	$237.70
HAZ	$1,521.54	$1,139.71	$636.38	$509.11	$636.38
TQL	$1,164.15	$933.62	$461.04	$386.13	$466.81

As shown in Table 42, the word processing costs for initial development of the courseware were considerably higher than any other costs associated with development, e.g., the salaries of instructional designers, course developers, and the instructional manager. While the costs of word processing were also the highest costs during revision, they were not proportionately as high as they were during initial development. One reason for this is that the project was only tasked to make corrections to the courses and not to conduct a full-scale revision.

Cost of Graphics. VTT instruction is highly dependent on graphics. The use of graphics is desirable when using TNET because of its two-way video capability. Therefore, graphics were used extensively in all the courses as shown in Table 44.

Prior to developing the graphics, FCCJ negotiated a fixed-fee contract price of $10.00 per graphic for all of the graphics produced for the project. However, by using the costs from Tables 42 and 43, it is possible to estimate the actual average cost of developing and revising each graphic used in a course. In order to calculate these costs, the total graphics development costs for a course were divided by the total number of graphics used in each course. The cost per graphic for each course is shown in Table 44.

Table 44
Cost of Individual Graphics

Course	[illegible]	[illegible]	[illegible]
71L10	1200	$10.75	$2.03
76Y10	1180	$7.96	$1.73
95B10	880	$12.46	$1.33
HAZ	211	$26.16	$5.40
TQL	220	$24.70	$4.24

The actual costs for initially developing the graphics for the MOS courses averaged about $10.00 each, which was the fixed fee contract price that was negotiated. However, the cost of producing each graphic for the special topics courses was considerably higher because there were fewer graphics.

Cost Projections

With the data from the previous analyses, it was possible to project the cost of designing, developing, and delivering a course under non-experimental conditions given certain parameters. Typical examples of these parameters are: the number of students, the length of the course, the number of sites, the number of graphics, etc.

Two analyses were conducted. The first analysis is for a course similar to the MOS courses presented by the FTP (e.g., one that is approximately ten days in length). The projection provides a range of costs from the lowest to the highest incurred by the FTP. The projection also provides the average of the total costs. The costs used in this analysis include the cost of designing, producing, and delivering a course to three remote sites. This analysis does not include any revision costs. The second analysis was calculated for a course that was approximately five days in length and delivered to four remote sites, as were the special topics courses.

The two generic courses are described below. The cost projections come from the tables in the previous analysis. The source table for the costs are listed in parentheses next to each cost item.

MOS-type Course. First, given a course that has 45 students, three TNET remote sites and one origination site, 80-hours of instruction, and 1087 graphics, the expected costs would be as shown in Table 45. Table 45 gives both the high and the low costs for each area.

Table 45
Cost Projection 1

Areas	Range of Costs
Analyze, design, and develop (excluding graphics) (Table 37)	$63,046.07 - $117,535.43
Delivery (Table 40)	$24,732.00 - $58,572.00
Remote Site Costs (Table 37)	$33,287.21 - $112,371.44
Graphics (Table 44)	$8,652.52 - $13,544.02
Total Costs	$129,727.80 - $302,022.89
Average Cost	$215,870.95

These figures assume that only one ten-day course is presented per month as was done during the FTP. This is an underutilization of TNET because a maximum of three 10-day

courses could be presented in a month. Using TNET for multiple courses in a month means that each course would only pay for the cost of use on the days that it was presented. Therefore, the total TNET cost would be shared by all courses. That would mean a reduction of approximately 14% in the delivery and remote site costs for each course.

However, if the same course was presented three times per month, not only would the TNET costs be reduced as described above, but the analyze, design, and development costs would be incurred for the first iteration of the course only. This would result in a savings of approximately $72,000.00 per course for the second and third delivery of the course. This savings, combined with the savings resulting from a fully utilized TNET system, would result in an overall cost reduction of 47% in subsequent courses.

On the other hand, if it is intended that a course would be presented only once or twice, the development would be significantly scaled down, thus reducing costs. It is impossible to determine precisely the cost reduction because the reduction would be dependent on the type of course offered. However, it could be expected that fewer media (e.g., graphics, videotapes) would be developed, on-line and off-line activities would be simplified, and less time would be devoted to organizing administrative and managerial functions. All of these modifications would decrease the VTT costs.

Special topics-type course. Second, given a course that has 60 students, four TNET remote sites and one origination site, 40-hours of instruction, and 500 graphics, the costs presented in Table 46 could be expected:

Table 46
Cost Projection 2

[illegible]	Range of Costs
Analyze, design, and develop (excluding graphics)	$31,523.00 - $58,767.60
Delivery	$16,488.00 - $39,048.00
Remote Site Costs	$44,383.00 - $149,828.40
Graphics	$3,980.00 - $6,230.00
Total Costs	$96,374.00 - $253,874.00
Average Cost	$175,124.00

Again, this result assumes underutilization of TNET. Presumably, full use of TNET would allow delivery of six, five-day courses. If the same course was offered six times, the costs would be much lower.

In summary, the purpose of Objective D3 was to differentiate between the experimental and non-experimental costs of the FTP. While the experimental and the non-experimental costs were separated, the non-experimental VTT costs are inflated because of the expense of leasing the TNET system and due to the high costs of the community college remote site.

Objective D4
Compare the Estimated Operational Course Design and Delivery Costs to the Cost of Selected Conventional, Training Options

The purpose of this objective was to determine whether or not VTT instruction was more cost effective than traditional options. Given this data, decisions can be made about the use of VTT in the context of other training options. While the project was unable to obtain specific data related to the costs associated with developing resident school courses, some assumptions could be made based on information from current general government contract airfares and Continental United States (CONUS) per diem rates. Travel costs were obtained from the current military pay scales and the JTR. The FLARNG indicated that to conserve resources some reserve commands now send students to two-week courses in an Annual Training (AT) status. This allows the commands to pay a maximum of two-days per diem rather than for the length of the course. It also eliminates the need to pay the basic allowance for quarters (BAQ) or the basic allowance for subsistence (BAS).

The following assumptions were made for all the courses in order to conduct these comparison analyses:

- Air fare was based on Orlando, Florida to St. Louis, Missouri round trip at the current government rate ($576.00)
- Standard CONUS per diem rate for resident school travel is $66
- Local per diem rate for VTT is $26
- Military instructor costs were based on the 1994 pay scale, E7 (over 11 years of service) pay rate, full BAQ (with dependents) and BAS
- For resident training, there were no delivery costs other than instructor salary and no site costs other than base operating costs; were not included in this analysis
- All VTT students lived within a 50-mile radius, did not require temporary billeting, and received the local per diem rate.

The costs of presenting VTT at the community college used in this comparison were taken from the costs shown in Table 37. The cost comparison of each of the five courses is shown in Tables 47 and 48. Any additional assumptions that were made for each course are included and explained.

MOS Courses

The comparison of the resident and VTT courses for 71L10, 76Y10, and 95B10 are included below. Additional assumptions regarding the MOS courses are that: (a) there were

three remote and one origination TNET sites, (b) the students attended the resident course in AT status, and (c) travel to the resident school is one day each way with no overnight stay.

Table 47
MOS Courses Cost Comparison
Resident versus Teletraining

	Delivery	Site Cost	Per Diem	Air Fare	Instructor	Total
71L10						
Resident			4,356.00	18,810.00	1,238.30	24,404.30
VTT	28,760.83	47,024.97	5,460.00			81,245.80
76Y10						
Resident			5,280.00	23,040.00	1,238.30	29,558.30
VTT	27,760.83	41,021.97	1,040.00			69,822.80
95B10						
Resident			3,432.00	14,976.00	1,238.30	19,646.30
VTT	27,099.96	67,972.91	9,464.00			104,536.87

The total cost of each option was divided by the number of students that were enrolled in each course (71L10, N=33; 76Y10, N=40; 95B10, N=26). In the 71L10 course, the estimated resident costs were $739.52 per student and for the VTT version of the course they were $2,461.99 per student. In the 76Y10 course, the estimated resident costs were $738.96 per student and for the VTT course they were $1,745.57 per student. In the 95B10 course, the estimated resident costs were $755.63 per student and for the VTT course they were $4,020.65 per student.

Special Topics Courses

The comparison of the resident and VTT courses for HazWaste and TQL are included in Table 48. Additional assumptions regarding these courses are that: (a) there were two out-of-state remote sites, (b) travel to the resident school is one day each way with two overnight stays, and (c) lodging costs are $50 per student per night.

Table 48
Special Topics Courses Cost Comparison
Resident versus Teletraining

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HAZ							
Resident			22,968.00	66,816.00	11,600.00	88.45	101,472.45
VTT	29,443.34	57,928.44	3,016.00				90,387.78
TQL							
Resident			11,880.00	34,560.00	6,000.00	88.45	52,528.45
VTT	27,294.27	57,928.44	1,560.00				86,782.71

The total cost of each option was divided by the number of students that were enrolled in the courses (HazWaste, N=116; TQL, N=60). The resident costs of HazWaste were $874.76 per student and for the VTT course they were $779.21 per student. The resident costs of TQL were $875.47 per student and for the VTT course they were $1,446.38 per student.

Analysis of Comparison

Only the HazWaste course provided a cost savings over traditional methods of military training. This finding supports the Navy's guidelines for selecting courses for VTT: courses should be shorter rather than longer, and have high throughput. Significant costs for the VTT delivery were those relating to the use of the community colleges to deliver the instruction. Because the community colleges had to cover all the costs they incurred, a fixed-price was negotiated by FCCJ for the cost of rooms, equipment, etc. These costs made the VTT option more expensive because such costs at the resident school were not included in the analysis.

As stated in the assumptions at the beginning of this objective, base operating costs were not calculated into the resident school training option. Only instructor salary and student travel costs were included. This obviously skews the resident training costs making them appear considerably less expensive than they actually are. This fact makes the cost comparison a rough estimate of two very diverse training options where all the cost components could not be directly assessed and therefore could not be compared.

Additionally, the TNET site cost is $7600 per month per site. This rate increased the cost of VTT delivery tremendously. If VTT were presented at a military facility, the TNET cost must still be paid, making a VTT resident course more expensive than the costs reported above.

In conclusion, the costs paid by the project for tuition, TNET equipment, and use of the community colleges' facilities greatly increased the price of this training option over traditional resident training. Whether or not the community college atmosphere and granting of college credit are worth the additional costs are issues that should be taken into consideration.

Conclusions About Cost

Four cost objectives were investigated. A cost model was adapted based on the model described in Bramble and Bauer (1991). The phases of the SAT model (e.g., design and development), plus site costs, administrative costs, and evaluation costs were included in the cost model.

Using the cost model, the experimental and non-experimental costs of the project were determined. The costs of conducting the pilot test (e.g., the experimental costs) for the five courses ranged from $220,101.88 to $319,985.73. The non-experimental costs for designing, delivering, and implementing the five courses ranged from $168,786.37 to $219,036.39.

When VTT instruction (non-experimental cost) was compared to conventional training options, it was cost-effective in only one instance. However, as previously stated, the resident training costs were underestimated and the VTT costs were inflated. When the VTT HazWaste course was compared to HazWaste resident training, the VTT course cost approximately $100 less per student. This decrease was due primarily to the fact that there were more students in the VTT course and because the resident course was assumed to require that students live in non-government quarters.

However, for the other four courses, the VTT course was more expensive. In the most extreme case, the 95B10 course cost approximately $3250 more per student than the resident course. This increase was due to the fact that there were few students in this course and that the majority of the students were out-of-state. Out-of-state tuition costs for these students increased the costs for 95B10. However, by either presenting three different courses in one month or the same course three times in one month, course design and development costs can be reduced and the TNET system can be fully used. This can result in a cost savings of between 14% and 47%.

As discussed in both the cost and technology sections of this report, courses that are short and have high demand or throughput are more cost effective than others. The cost comparison, specifically the cost of the HazWaste course, supports this conclusion.

Issues

Even though the experimental costs for the project were removed when the cost analysis was performed, the fact that an experiment was being conducted influenced the costs obtained for VTT. First and foremost, the cost of leasing the TNET system are significant: $7600 per month per site. While in some circumstances it might be cost effective to purchase a VTT system, the technology changes rapidly. Purchase of a system that becomes outdated and then must be replaced or updated may cost more in the long run than rental costs. However, in general, the technology costs should decrease in the future.

The rental of TNET includes use of unlimited satellite time. When selecting a system for use, the satellite costs per hour must be considered.

During this project, TNET was underutilized. When the special topics courses were presented, the system was only being used three or four days a month for delivery of instruction, yet the project was charged for an entire month of use. Earlier in the project, even though the courses were ten days long, the system was being used for instructor practice and to field test the graphics and some of the instructional activities. Underutilization of expensive technology such as TNET greatly increases the cost of course delivery. For VTT to be cost effective, TNET should be fully used.

All VTT courses require extensive course design and development; the FTP courses were no exception. These design and development costs are expensive. Presumably, this expenditure resulted in excellent instruction. Again, no monetary value can be placed on superior training. The value of excellent training at a distance versus unavailable training at a resident school must be considered when choosing to adopt VTT.

Four TNET systems were rented out of project funds for a period of six months. When these costs were compared to traditional instruction it was difficult to achieve a cost savings unless the same course was presented multiple times. Because the design and development costs are one-time expenses and are not incurred each time the course is presented, delivering the same course more than once will always decrease its overall cost.

While students who took the FTP courses wanted college credit, and the military encourages students to receive credit (Watt, 1988), providing credit increased the costs of delivering the courses at a community college. Costs associated with student fees and credit accounted for between 1.26% (TQL) to 10.45% (71L10) of the total remote site operating costs. Thus, while the costs of resident training were considerably less for four of the five courses, students in resident training do not have the benefit of receiving credit. Therefore, a cost comparison of VTT delivered at the community colleges and at the resident schools does not take into account the non-monetary value of receiving college credit for military training.

Another issue arises as to whether or not the costs of implementing VTT would be the same as for the FTP if the military had an on-going VTT program. Administration costs (e.g., travel, coordination, etc.) and remote costs would be reduced thus making VTT a more viable cost-effective training option and one to be considered carefully.

When comparing resident costs to VTT delivery, an issue to consider is how to get distance delivery at a competitive cost so that soldiers have the option of taking more courses that are both appropriate for VTT and that might not otherwise be available to students. While it is unlikely that distance delivery can be done at a fraction of the costs of resident training, other factors such as access and college credit can increase the value of VTT for the military. Reasonable differences in the costs of the two options may be more acceptable in light of the importance of these factors.

SUMMARY AND CONCLUSIONS OF THE FLORIDA TELETRAINING PROJECT

The purpose of the Florida Teletraining Project was to assess the feasibility of using two-year community colleges to offer military programs of instruction that addressed specific military duties and content. The courses were designed, developed, and delivered by faculty at FCCJ in conjunction with military SMEs from two Florida USARF schools. DITRA was the government agency in charge of program management. IST was the prime contractor and provided technical assistance to FCCJ.

Five courses were delivered over TNET, the Army's teletraining network. Three of the courses were U.S. Army Reserve Component Configured Courseware (RC^3): 71L10, Administrative Specialist; 76Y10, Unit Supply Specialist; and 95B10, Basic Military Police. These courses were delivered once each to Army National Guard and Army Reserve soldiers who were seeking to be reclassified in these MOSs. Two of the courses were Navy special topics courses: Handling Hazardous Waste--Activity Level (HazWaste) and Total Quality Leadership (TQL). These two courses addressed joint service needs and were made available to members of interested services and components, e.g., Army National Guard, U.S. Marines, Air National Guard, the U.S. Navy, and the U.S. Coast Guard. TQL and HazWaste were offered two and three times respectively.

The courses were delivered to three Florida community college remote sites: SPJC, VCC, and a classroom at FCCJ. HazWaste and TQL were also offered at two out-of-state sites during the final administrations of these courses: Ft Taylor Hardin in Montgomery, Alabama and Camp Fogarty in East Greenwich, Rhode Island.

Twenty-one evaluation objectives were identified for the project in the following categories: technology, instruction, community colleges, and cost. Data related to each of the objectives were collected from: (a) students, (b) course developers/VTT instructors, (c) all remote site personnel including ICs, POCs, and technicians, (d) administrative project staff at FCCJ, (e) the technical and production teams at FCCJ, and (f) military personnel including SMEs, on-camera military instructors, and military remote site personnel.

Each objective was addressed separately in the final report and a summary of the data was presented. In addition, each category of objectives, i.e., technology, instruction, community colleges, and cost, was summarized. Issues related to the objectives were identified. In general, the TNET system was reliable, the instruction was effective, and the community colleges were able to present high quality instruction. However, in this project VTT was more expensive to implement than resident training.

The following list is a brief overview of the major findings related to the FTP.

Technology:

- TNET was 99% reliable; students and instructional personnel rated the quality of the system high.
- Students and ICs indicated that they preferred a VTT approach to traditional training at a military facility.
- The courses selected for VTT presentation were generally suitable for the technology although some modifications were made (e.g., off-line activities) to accommodate the technology and the course content.
- Even though training was provided, the instructional personnel felt that more training and practice was needed on TNET.

Instruction:

- All students passed the stated learning objectives, and over 90% of all students in the MOS courses passed the performance tests on the first attempt.
- No comparisons could be made between the performance records of students in the VTT courses and those in other training options.
- Students rated the learning methods and activities, including the interactivity provided in the VTT courses, to be effective. These learning methods stimulated student interest and the students were generally motivated by the VTT instruction.
- No student demographic variables predicted success or lack of it for military students and hence one can expect that VTT is an acceptable approach for the general military population.
- Students rated all the instructional personnel, VTT instructors, MIAs, ICs, and MSCs, as effective. A question was whether or not civilians can provide quality instruction to military students due to their lack of military training. Some students felt that a military instructor should have presented the instruction, however, all students passed the learning objectives for all five courses.

Community Colleges

- FCCJ had the technical and instructional capabilities to implement VTT instruction. The technic[illegible] [illegible]f, TV studio, and production facilities (one of the best among community c[illegible]s in Florida) were excellent.

- Community college faculty are professional educators. While the faculty at FCCJ lacked instructional design and military training expertise, they were able to design and present high quality instruction given specific training.

- Staff training was presented to all instructional and technical personnel. This training was judged to be of high quality by the staff and they indicated that it enabled them to perform their roles and responsibilities.

- The course developers/VTT instructors had the most extensive training of all the instructional personnel. This included instruction in VTT presentation, instructional design, and military training.

- The community colleges were able to grant academic and continuing education credit for all courses. Although not all students were interested in receiving credit, those that were, indicated that college credit was a definite advantage to receiving military training at a community college.

- The three community colleges were organized to work together through subcontracts; this proved to be a very effective mechanism.

- There was a complex web of community college, university, government, and military organizations that had to work together to implement this project. Formal contracts, MOUs, IPRs, and a number of informal agreements enabled the groups to work together effectively.

Costs:

- With the exception of the HazWaste course, the VTT courses in the FTP were more expensive when compared to resident training. The HazWaste course was cost effective because there were a large number of students (N=116) in the course and because of travel and per diem savings.

- The costs associated with providing college credit (in-state and out-of-state) and the lease of the four TNET systems greatly increased the costs of the VTT courses.

- The VTT courses become more cost effective if: (a) the same course is presented more than once (because design and development costs are paid only once), and (b) different courses are presented in the same month, (because each course would be charged only for the days the course is implemented rather than paying the TNET costs for the entire month).

Lessons Learned

- The courses developed for this project were used as a component of the evaluation of the pilot test. Decisions made for the purposes of the project may not have been made had this not been a pilot test. For example, students were assigned to a given remote site, not necessarily the one closest to their home, to insure that there were sufficient number of students for the evaluation. However, under regular instructional circumstances, students should be assigned to the nearest remote site.

- The choice of technologies, in this case TNET, influenced the design of instruction because of the video transmission rate. The FTP courses are not directly adaptable to other VTT systems. They would have to be modified to be used effectively.

- TNET transmission is influenced by inclement weather. Contingency plans should be devised that can be used if instruction is interrupted for any reason.

- Origination site technicians must establish a working relationship with NCC. This allows problems to be solved in a timely and efficient matter.

- Origination and remote site technicians are invaluable resources. Origination site technicians should be knowledgeable in various communication technologies.

- VTT must be considered in the context of other training options. Courses should be selected for VTT delivery that are short (one to two weeks in length), are primarily cognitive, and have high demand or throughput.

- Colleges must provide adequate facilities for VTT instruction, e.g., classroom space, facilities, etc.

- While the TNET equipment is not difficult to use, some personnel are intimidated by any new technology. Care must be taken to provide sufficient practice and technical support to such personnel when the technology is in use.

- Military POIs and syllabi can be successfully reconfigured for VTT instruction.

- The results of the data from the PTs may assist proponent schools to evaluate their curricula.

- It took longer to present RC^3 courses by VTT than to present platform instruction because of planned interaction and the administration of on-site PEs. If the military adopts VTT, the overall course length will increase in order to present the same content.

- Courses that are taught in day long sessions (e.g., 8 hours/day) need to be designed so that students have a break from viewing the TNET monitor. Off-line activities, including activities that are interactive, are one way to accomplish this goal.

- Students who were more highly educated or held a higher military grade or rank were more critical than others of the word picture concept that was used in this project. Other ways of involving these students in the instructional process needs to be explored.

- Careful attention must be paid to designing activities that allow students to interact with each other on the network.

- The different cultures of the military and the community college, in addition to the roles and responsibilities assigned to each group, require coordination by individuals who can link the two communities.

- Military and community college coordination with regard to presenting VTT instruction should begin early during any project.

- If community colleges and the military are going to work together to provide effective and cost efficient training to military students, using both ICs and MSCs at the remote sites is unnecessary. The issues surrounding how to grant college credit and how to certify military students with either the IC or MSC must be resolved.

- If VTT is adopted by any military training organization, issues about the roles of existing personnel will arise. Resident course instructors, like community college faculty, can be learn to present VTT courses given appropriate staff training.

- Although the military can be taught to deliver instruction via VTT, military instructors felt apprehension about the loss of positions and about assuming new roles if VTT is widely adopted.

- Course design, development, and delivery required a team approach because the community college faculty who taught the courses did not have sufficient military background. A military SME assisted the community college faculty in design, development, and implementation. This doubling of resources was neither time nor cost effective.

- The quality of the POIs and syllabi received from the military directly effects the time and the costs for reconfiguring military courses for VTT.

- The larger the population that can be served using VTT, the greater the cost savings. An on-going VTT program would be more cost effective.

- It is nearly impossible to compare VTT and resident training without complete data on the cost of resident training. This would include the costs for design, development and delivery of the courses, and for the base operating costs.

- If the goal of a project such as the FTP is to compare traditional and mediated instruction, all associated costs for all training options must be made available.

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Acronym List

AAR	After Action Review
AC	Active Component
ACES	Army Continuing Education Support
ADT	Active Duty for Training
AETD	Army Extension Training Directorate
ALMC	Army Logistics Management Center
ANCOC	Advanced Non-commissioned Officer Course
AR	Army Regulation
ARCOM	Army Reserve Command
ASVAB	Armed Services Vocational Aptitude Battery
AT	Annual Training
ATSC	Army Training Support Center
BAQ	Basic Allowance for Quarters
BAS	Basic Allowance for Subsistence
BNCOC	Basic Non-commissioned Officer Course
CAI	Computer Assisted Instruction
CAS	Computer Assisted Study
CEO	Chief Executive Officer
CEC	Continuing Education Credit
CES	Comparative Effectiveness Studies
CESN	CNET Electronic Schollhouse Network
CLI	Compression Labs, Inc.
CMC	Computer Mediated Communications
CNET	Chief of Naval Education and Training
CONUS	Continental United States
DITRA	Defense Institute for Training Resources Analysis
DoD	Department of Defense
DLIFLC	Defense Language Institute Foreign Language Center
ETS	Expiration Term of Service
FCCJ	Florida Community College at Jacksonville
FCTCLANT	Fleet Combat Training Center, Atlantic
FLARNG	Florida Army National Guard
FORSCOM	U.S. Army Forces Command
FTE	Full-time Student Equivalent
FTP	Florida Teletraining Project
FTX	Field Training Exercise
GED	General Equivalency Diploma
HAZ	Handling Hazardous Waste - Activity Level
HNS	Hughes Network Service
ICG	Instructional Coordinators Guide
IDT	Inactive Duty Training
IG	Instructor's Guide
IPR	In-Progress-Review
IC	Instructional Coordinator
ISD	Instructional Systems Design

ISG	Interactive Study Guide
IST	Institute for Simulation and Training
IDU	Indoor Unit
JTR	Joint Travel Regulation
KBPS	Kilo Bits per Second
MIA	Military Instructional Assistant
MI	Military Intelligence
MOS	Military Occupational Specialty
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MP	Military Police
MSC	Military Site Coordinator
NAWC TSD	Naval Air Warfare Center Training Systems
NCC	Network Control Center
NCOIC	Non-Commissioned Officer in Charge
NEESA	Navy Environmental Engineering Support Activity
NTSC	Naval Training Systems Center
OASD (FM&P)	Office of the Assistant Secretary of Defense, Force Management & Personnel
OJT	On-the-job Training
OSD	Office of the Secretary of Defense
PE	Practical Exercise
PMOS	Primary Military Occupational Specialty
POC	Point of Contact
POI	Programs of Instruction
PT	Performance Test
RC	Reserve Component
RC^3	Reserve Component Configured Course
RCTI	Reserve Component Training Institutions
SAT	Systems Approach to Training
SMART	System for Managing Asynchronous Remote Training
SME	Subject Matter Experts
SPJC	St. Petersburg Junior College
SPSS	Statistical Package for Social Sciences
ST	Skilled Technical
STX	Situational Training Exercise
TNET	U.S. Army Teletraining Network
TQL	Total Quality Leadership
TPDC	Defense Training and Performance Data Center
TRADOC	U.S. Army Training and Doctrine Command
UCF	University of Central Florida
UPS	Uninterrupted Power Supply
USARF	U.S. Army Reserve Forces
VCC	Valencia Community College
VSAT	Very Small Aperture Terminal
VTT	Video Teletraining

Appendices

Appendix A

FTP Evaluation Instruments

Appendix A
FTP Evaluation Instruments

Form		Data Source	Data Collection Schedule	Course
A	Student Background Questionnaire	Student	Prior to Inst	
B	MOS Related Questionnaire	Student	Prior to Inst	MOS only
C-1	Pretest	Student	Prior to Inst	
C-2	Posttest	Student	After Inst	
D	Entry Typing Aptitude Score Sheet	Student	Prior to Inst	71L10 only
E	IC Daily Course Rating	IC	End of each day	
F	End-of-Course Typing Score Sheet	Student	After Course	71L10 only
G	Student Course Evaluation	Student	Last Event	
H	Student Rating: Teaching & Delivery	Student	Last Event	
I	Conditions: Effective Crs Delivery	Evaluator	End of Course	
I-A	Out-of-State Site Information	Evaluator	End of Course	HAZ/TQL only
J	Formative/Intensive Site Evaluation	Student	1-2-3 Day	71L10 only
J-A	Evaluator Observation	Evaluator	During Inst	
K	Comm College Admin POC Interview	Admin	End of Course	
L	Student Interview Form	Student	End of Course	MOS only
GHL	Course Critique	Student	End of Course	HAZ/TQL only
M	MIA Interview Form	MIA	End of Course	MOS only
M-1	Course Design & Development	VTT Inst	End of Course	HAZ/TQL only
M-2	MIA Implementation	MIA	End of Course	HAZ/TQL only
N	VTT Instructor Interview Form	VTT Inst	End of Course	MOS only
O	Comm College IC Interview	IC	End of Course	MOS only
P	MSC Interview Form	MSC	End of Course	MOS only
Q	Comm College IC Questionnaire	IC	End of Course	
QA	MSC Questionnaire	MSC	End of Course	95B10 only
*R	Unit Level Military Supervisor	Admin	End of Course	MOS only
*S	Interview Unit Training NCO	Admin	End of Course	MOS only
T	TNET Log	Techn	Daily	
V	Performance Test Record	VTT	Daily	MOS only
W	Student Aptitude Area Scores	Student	End of Course	MOS only
X	Cost Data	Evaluator	End of Course	MOS only
Y	Background Data on Civilians	Students	Prior to Inst	MOS only
Z	Background Data on Military	Students	Prior to Inst	MOS only

Military Forms

FBH30244	USARF Go-No-Go Form	MSC	Daily	MOS only
FORSCOM 270-R	USARF School Attendance	MSC	Daily	MOS only
2AA Form 26-R	USAR School Class Status	MSC	Daily	MOS only
81st ARCOM100	All Course Training Progress	MSC	Daily	MOS only
2AA Form 29-R	USAR School Visitors Register	MSC	Daily	MOS only
2AA Form 54-1-R	USARF School Classroom Eval	MSC	Daily	MOS only

Key:

Instructional Coordinator	IC
Military Instructional Assistant	MIA
Military Site Coordinator	MSC
Student	S
Video Teletraining	VTT

* Not Collected - DITRA Directive

Appendix B

Description of Evaluation Forms

Appendix B
Description of Evaluation Forms

- Forms A, B, Y, and Z were used to collect demographic and background information from the students. Form W was used to record ASVAB scores for students in the MOS courses.

- Forms C1, C2, D, and F were the pre and post test instruments used in each of the five courses. These instruments are described in Objective B1.

- Form V was used to record the students' scores on the performance tests for the MOS courses.

- Forms G, H, L, and GHL were used to collect course rating data from the students. Both open-ended and closed response items were asked. Students stated their perceptions about the adequacy of courses, the equipment, the instructors, etc. Form GHL was a composite of Forms G, H, and L and was given to the HazWaste and TQL students because of time constraints.

- Forms M, M1, M2, and N were used to collect course preference data from the VTT instructors and the MIAs. A wide range of questions concerning their perceptions about the project, the course development and course delivery processes, the students, and TNET were asked.

- Forms K, O, P, Q, and QA were used to collect data from the civilian and remote site personnel regarding their perceptions about course delivery, TNET, the students, etc.

- Form E was the instrument used to receive feedback from the remote sites about each instructional day. These forms were used as the basis for the AARs conducted at the conclusion of each day.

- Form T was used to record information about the TNET equipment (i.e., when the equipment was turned on and off, and any problems that occurred).

- Forms I and IA were checklists used by the project evaluators to determine whether or not each site had all the materials and equipment required for each course on the first day of delivery. For example, evaluators checked to see that all course materials were available and that the TNET equipment was operative.

- Form J was used at FCCJ2 only. This site was designated as the formative evaluation site. On the first several days of each of the MOS courses, students provided feedback about the adequacy of the course, and one evaluator rated each course. This data was then used to make immediate corrections to the courses. The data was also used to influence the development of the other courses. Therefore, these data were not used to evaluate the project, but were used as a

component of course development. This approach is described in the *Reconfiguration* document.

- Form J-A was used by the FTP evaluators to record interaction patterns during each of the MOS courses.
- Form X was used to collect the cost data.
- The military forms used were standard Army forms. These were used during each of the MOS courses so that the students could be certified.

Appendix C

Network Guidelines for the Florida Teletraining Project

Appendix C
Network Guidelines for the Florida Teletraining Project

- Equipment was used only by technicians, instructors, and others trained in its use by certified ATSC/TNET personnel.

- Use was scheduled in 15 minute blocks. Prior to each use, 30 minutes was reserved for pre-use testing.

- A log of use, maintenance and down time was maintained for the duration of the project using log sheets provided by the Project.

- Visitors were allowed on site to observe teletraining in progress, but no interruptions or disruption of instruction by visitors were permitted for any reason.

- Security was maintained for the classrooms designated for instruction. Each room was locked when not in use for this project.

- All equipment was secured during instruction, during instructional breaks and between instructional periods.

- Designated TNET classrooms could be used by approved military units and community college instructors for other than FTP instruction if the following criteria were met:

    - Intended use was acceptable to the administration at the individual receive sites
    - Requests had to be submitted through FCCJ at least five (5) working days in advance of intended use. FCCJ scheduled the conferences with the NCC.
    - Use could not interfere with any training, demonstrations, instructional or evaluation activities that were part of the FTP
    - Use had to be acceptable in terms of time and availability of classroom space, equipment and satellite time

- Requests for time and date changes had to be made through the Network Management at FCCJ.

- A TNET trained technician had to be on hand if the equipment was used.

- Rules and regulations as established for equipment use for FTP had to be followed. These included classroom protocol and control of the audio at the remote sites were located in the Instructor Guide, Instructional Coordinator Guide and the Interactive Study Guide developed for each course.

Appendix D

Training Schedule

CLASS TRAINING SCHEDULE	CLASS: TOTAL QUALITY LEADERSHIP		POI: NON-STANDARD
	STATION: FLORIDA TELETRAINING PROJECT NETWORK		
	PAGE 1 of 4 PAGES	INCLUSIVE DATES: 22 FEBRUARY 1993	

WHEN	WHO	WHAT	WHERE	TRAINER	REFERENCE	REMARKS
MONDAY 22 FEB 93						UNIFORM: BDUs SOFT CAP
0730-0800	INSTRUCT'L COORDINATOR	NETWORK START-UP/PREPARATION FOR TRAINING	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT	PROJECT MANUAL INSTRUCTIONAL COORDINATOR GUIDE	
0800-0815	ALL STUDENTS	IN-PROCESSING	VTT CLASSROOMS	INSTRUCTIONAL COORDINATOR	PROJECT MANUAL COMMUNITY COLLEGE CATALOG	
0815-0845	ALL STUDENTS	PRE-TEST	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	INSTRUCTIONAL COORDINATOR GUIDE	PRE-TEST FOR PROJECT EVALUAT'N PURPOSES ONLY
0845-1000	ALL STUDENTS	COURSE OVERVIEW/INTRODUCTION TO TNET (MODULE 0)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR		

CLASS TRAINING SCHEDULE

CLASS: TOTAL QUALITY LEADERSHIP **POI:** NON-STANDARD

STATION: FLORIDA TELETRAINING PROJECT NETWORK

 INCLUSIVE DATES: 22 FEBRUARY 1993

WHEN	WHO	WHAT	WHERE	TRAINER	REFERENCE	REMARKS
MONDAY 22 FEB 93 CONTINUED						UNIFORM BDUs SOFT CAP
1000-1100	ALL STUDENTS	BACKGROUND OF TQL (MODULE 1)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	POI INSTRUCTIONAL COORDINATOR GUIDE INTERACTIVE STUDY GUIDE	
1100-1245	ALL STUDENTS	LIFE IN THE RED BEAD FACTORY (MODULE 2)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	POI INSTRUCTIONAL COORDINATOR GUIDE INTERACTIVE STUDY GUIDE	
1245-1345	ALL	NOON MEAL				
1345-1445	ALL STUDENTS	BASIC PRINCIPLES OF TQL (MODULE 3)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	POI INSTRUCTIONAL COORDINATOR GUIDE INTERACTIVE STUDY GUIDE	

CLASS TRAINING SCHEDULE	CLASS: TOTAL QUALITY LEADERSHIP STATION: FLORIDA TELETRAINING PROJECT NETWORK PAGE 3 of 4 PAGES	POI: NON-STANDARD INCLUSIVE DATES: 22 FEBRUARY 1993

WHEN	WHO	WHAT	WHERE	TRAINER	REFERENCE	REMARKS
MONDAY 22 FEB 93 CONTINUED						UNIFORM BDUs SOFT CAP
1445-1515	ALL STUDENTS	METHODS AND TOOLS (MODULE 4)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	POI INSTRUCTIONAL COORDINATOR GUIDE INTERACTIVE STUDY GUIDE	
1515-1545	ALL STUDENTS	IMPLEMENTATION (MODULE 5)	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	POI INSTRUCTIONAL COORDINATOR GUIDE INTERACTIVE STUDY GUIDE	
1545-1615	ALL STUDENTS	POST TEST	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT INSTRUCTIONAL COORDINATOR	INSTRUCTIONAL COORDINATOR GUIDE	POST TEST IS FOR PROJECT EVALUAT'N PURPOSES ONLY

CLASS TRAINING SCHEDULE

CLASS: TOTAL QUALITY LEADERSHIP **POI:** NON-STANDARD

STATION: FLORIDA TELETRAINING PROJECT NETWORK

PAGE 4 of 4 PAGES **INCLUSIVE DATES:** 22 FEBRUARY 1993

WHEN	WHO	WHAT	WHERE	TRAINER	REFERENCE	REMARKS
MONDAY 22 FEB 93 CONTINUED						UNIFORM BDUs SOFT CAP
1615-1645	ALL STUDENTS	PROJECT EVALUATION ACTIVITIES	VTT CLASSROOMS	INSTRUCTIONAL COORDINATOR	INSTRUCTIONAL COORDINATOR GUIDE PROJECT MANUAL	
1645-1745	INSTRUCT'L COORDINATOR	AAR	VTT CLASSROOMS	VTT INSTRUCTOR MILITARY INSTRUCTIONAL ASSISTANT		

Appendix E

Tables from Objective B1

Table B1.1

71L10: Performance Test

(N = 33)

Test	Part	Initial % GOs (N)	$\bar{X}$ (SD) Initial GOs	Retest % GOs (N)	% Final GOs
Resupply	I	75.8% (25)	93.20 (11.08)	100% (8)	100%
	II	100% (33)	97.59 (5.00)	N/A (0)	100%
Memo	I	87.9% (29)	88.83 (8.89)	100% (4)	100%
SP Memo	I	97.0% (32)	87.44 (11.03)	100% (1)	100%
	II	97.0% (32)	97.56 (3.69)	100% (1)	100%
Endorsement	I	97.0% (32)	91.37 (9.26)	100% (1)	100%
	II	93.9% (30)	95.94 (4.75)	100% (3)	100%
Letter	I	97.0% (32)	93.23 (5.31)	100% (1)	100%
Assemble Corres.	I	51.5% (17)	84.71 (11.79)	100% (16)	100%
Joint Message	I	93.9% (31)	88.87 (12.83)	100% (2)	100%
R/T Classified	I	90.9% (30)	99.35 (2.50)	100% (3)	100%
	II	93.9% (30)	94.84 (9.62)	100% (3)	100%
Route I/O	I	100% (33)	88.18 (14.89)	N/A (0)	100%
	II	97.0% (32)	89.69 (14.48)	100% (1)	100%
	III	93.9% (31)	100.0 (.00)	100% (2)	100%
	IV	63.6% (21)	80.00 (14.49)	100% (12)	100%
	V	93.9% (31)	94.19 (12.05)	100% (2)	100%
Files	I	87.9% (29)	86.90 (10.04)	100% (4)	100%
	II	63.6% (21)	100.0 (.00)	100% (12)	100%
	III	84.8% (28)	100.0 (.00)	100% (5)	100%
Average		90.03%		100% (4)	100%
Typing		36% (12) Passed Pretest	29.83 (5.29)	82% (27) Passed Posttest	36.89 (8.98)

Table B1.2

76Y10: Percentage Passing Proficiency Tests

(N = 40)

UNIT	Initial % GOs (N)	$\bar{X}$ (SD)	Retest	Total
D3.9 ARMS	97.5% (39)	93.51 (6.44)	100% (1)	100%
D4.9 Status files/requests	92.5% (37)	81.11 (8.91)	100% (3)	100%
D5.9 Hand receipts & issuance	100% (40)	90.65 (5.36)	N/A	100%
D6.9 Relief from responsibility	100% (40)	90.12 (4.13)	N/A	100%
E2.9 Personal clothing requests	100% (40)	96.90 (2.81)	N/A	100%
E3.9 Organizational clothing & individual equipment	97.5% (39)	90.23 (8.06)	100% (1)	100%
Average	97.99%			

Table B1.3

95B10: Performance Test Results

(N = 26)

UNIT		Initial % GOs (N)	$\bar{X}$ (SD)	% Final GOs
ZH 200	**Military Law**			
	Lawful Apprehension	77.8% (21)	94.18 (6.57)	100%
	Search & Seizure	100% (26)	95.74 (5.58)	100%
	Miranda Rights	92.6% (25)	94.04 (6.86)	100%
LH 200	**Use of Force**	92.6% (25)	91.11 (10.13)	100%
LH 206	**Apprehension**			
	Apprehend a Subject	100% (26)	98.81 (3.88)	100%
	Select Search	100% (26)	99.26 (2.67)	100%
	Prone Search	77.8% (21)	97.62 (4.18)	100% (6)*
	Stand-up Search	83.3% (24)	96.24 (5.38)	100%
	Wall Search	92.6% (25)	96.74 (4.10)	100%
	Pat Down Search	92.6% (25)	99.88 (0.59)	100%
LH204	**Reports and Forms**			
	DA Form 2823	74.1% (20)	97.04 (5.16)	100%
	DA Form 3975	55.6% (15)	95.19 (6.36)	100%
LH 210	**Gather Information**	96.3% (26)	93.08 (9.28)	100%
LH 210	**Conduct Interviews**	96.3% (26)	95.85 (6.77)	100%
LH 400	**Patrol Incidents**			
	Traffic	84.6% (22)	94.08 (6.06)	100% (1)*
	Accident	92.3% (24)	94.72 (6.78)	100%
	DUI	92.3% (24)	95.29 (6.29)	100%
	Transport	96.2% (25)	93.24 (7.26)	100%
	Direct	100% (26)	100.0 (0.00)	100%
	Bomb	100% (26)	86.92 (8.84)	100%
	Alarms	100% (26)	95.00 (6.84)	100%
	Hostage	100% (26)	90.80 (7.86)	100%
	Domestic	100% (26)	93.80 (4.91)	100%
	Protect	100% (26)	92.50 (8.28)	100%

Table B1.3

(Continued)

UNIT		Initial % GOs (N)	$\bar{X}$ (SD)	% Final GOs
LH 208	**Identify Evidence**			
	Section 1	96.2% (25)	98.00 (5.00)	100%
	Section 2	96.2% (25)	92.27 (9.08)	100%
	Section 3	88.5% (23)	100.0 (0.00)	100%
	Section 4	100% (26)	100.0 (0.00)	100%
LH 200	**Child Abuse**	100% (26)	93.85 (9.41)	100%
SH 202	**Nuclear Security**			
	Escort	100% (26)	92.12 (10.21)	100%
	Patrol	100% (26)	93.85 (9.41)	100%
	Enforce	100% (26)	96.92 (7.36)	100%
	Duress	100% (26)	89.42 (10.03)	100%
LH 202	**Self Defense**			
	Phase I	100% (26)	100.0 (0.00)	100%
	Phase II	100% (26)	96.92 (5.27)	100%
Average		94.5%		

*(x) = Number of Missing Cases

Table B1.4

71L10: Student Self-Assessment of Proficiency

% Students (N*)

Task	Have Performed Task		Know How to Perform Task	
	YES	NO	YES	NO
Resupply	15.2% (5)	72.7% (24)	9.1% (3)	78.8% (26)
SP Memo	15.2% (5)	72.7% (24)	6.1% (2)	81.8% (27)
Letter	54.5% (18)	33.3% (11)	45.5% (15)	42.4% (14)
Joint Message	15.2% (5)	72.7% (23)	3.0% (1)	84.8% (28)
R/T Classified	6.1% (2)	81.8% (27)	0.0% (0)	87.9% (29)
Route I/O	18.2% (6)	69.7% (23)	6.1% (2)	81.8% (27)

* Missing data = at least 4 students for all items

Table B1.5

76Y10: Average Scores on Self-Report Questionnaire

5 Point Scale[1]

(N = 40)

UNIT	PRE	POST
D2.9 File Procedures	3.2	4.7
D3.9 ARMS	2.5	4.6
D4.9 Status files/requests	2.4	4.5
D5.9 Hand receipts & issuance	2.7	4.7
D6.9 Relief from responsibility	2.1	4.6
E2.9 Personal clothing requests	2.2	4.8
E3.9 Organizational clothing & individual equipment	2.6	4.6
Average	2.5	4.6

[1]Note:
5 = I can perform the task proficiently and to Army specifications.
4 = I can perform the task adequately, but I need a reminder or assistance to help me perform the task proficiently.
3 = I can perform the task to some extent, but I am not proficient even with some assistance.
2 = I cannot perform the task, but I am familiar with it.
1 = I cannot perform the task and I am not familiar with it.

Table B1.6

95B10: Average Scores on Self-Report Questionnaire

5 Point Scale[1]

(N = 26)

UNIT		PRE	POST
LH 200	IPC Skills (IMPACT)	2.1	4.5
LH 200	Military Law	1.9	4.7
LH 200	Use of Force	2.7	4.9
LH 206	Apprehension	2.2	4.7
LH 204	Prepare Military Police Reports & Forms	1.3	4.7
LH 210	Gather Information/ Conduct Interviews	1.7	4.8
LH 400	Perform Patrol Duties	1.9	4.7
LH 208	Identify (Collect) and Process Evidence	1.7	4.7
LH 200	Child Abuse	2.6	4.7
SH 202	Nuclear Physical Security	2.0	4.8
LH 202	Self Defense	2.0	4.8
	Average	2.0	4.7

[1]Note: 5 = I can perform the task proficiently and to Army specifications.
4 = I can perform the task adequately, but I need a reminder or assistance to help me perform the task proficiently.
3 = I can perform the task to some extent, but I am not proficient even with some assistance.
2 = I cannot perform the task, but I am familiar with it.
1 = I cannot perform the task and I am not familiar with it.

Table B1.7

TQL: Average Scores on Self-Report Questionnaire

5 Point Scale[1]

(N = 59)

MODULE	**PRE**
Module 1: Background	2.3
Module 2: Red Bead	No Data Collected
Module 3: Basic Principles	1.1
Module 4: Method/Tools	1.9
Module 5: Implementation	1.3

[1]Note:
5 = I can perform the task proficiently.
4 = I can perform the task adequately, but I need a reminder or assistance to help me perform the task proficiently.
3 = I can perform the task to some extent, but I am not proficient even with some assistance.
2 = I cannot perform the task, but I am familiar with it.
1 = I cannot perform the task and I am not familiar with it.

Appendix F

Tables from Objective B3

Table B3.1

Student Ratings of Instructional Methods

(5 Point Scale, 5 = Highest)

$\bar{X}$ (SD)
(% Ranking 3,4,5)
(N)

ITEM	71L10	76Y10	95B10	HAZ	TQL
Word graphics	3.65 (1.14) (75.7%) (31)	3.82 (1.23) (82.5%) (38)	3.44 (1.04) (76.9%) (25)	4.33 (0.77) (96.4%) (110)	4.43 (0.65) (97.9%) (47)
Value of Practical exercises	4.18 (0.98) (90.9%) (33)	3.44 (1.19) (95.0%) (32)	4.04 (0.89) (92.3%) (25)	4.26 (0.82) (95.5%) (111)	4.15 (0.81) (95.8%) (47)
Instructional games	2.61 (1.45) (42.4%) (28)	3.44 (1.19) (62.5%) (32)	3.46 (1.25) (69.2%) (24)	NA	NA
Remediation helpful	4.13 (0.88) (87.9%) (31)	3.68 (1.02) (80.0%) (40)	4.05 (0.80) (80.8%) (21)	NA	NA
Typing effective[1]	4.39 (1.03) (93.9%) (33)				
Microfiche effective[2]		3.82 (1.23) (80.0%) (40)			
MSC directing PEs[3]			4.60 (0.58) (96.2%) (25)		

[1] 71L10 only
[2] 76Y10 only
[3] 95B10 only

Table B3.2

Student Ratings of Interactivity

(5 Point Scale, 5 = Highest)

$\bar{X}$ (SD)
(% Ranking 3,4,5)
(N)

ITEM	71L10	76Y10	95B10	HAZ	TQL
Opportunities to ask questions	4.09 (0.89) (93.9%) (32)	4.03 (1.19) (85.0%) (40)	4.31 (0.84) (100%) (26)	4.18 (0.89) (95.5%) (111)	4.21 (0.77) (97.9%) (48)
Opportunities to ask follow-up questions	4.00 (0.92) (93.9%) (32)	4.00 (1.20) (85.0%) (40)	4.23 (0.82) (100%) (26)	NA	NA
Interaction w/students on-site	4.62 (0.61) (97.0%) (32)	4.47 (0.82) (32.5%) (40)	4.58 (0.50) (100%) (26)	4.33 (0.74) (99.1%) (111)	4.11 (0.76) (97.9%) (47)
Interaction w/students on-network	3.38 (1.48) (63.6%) (32)	3.50 (1.41) (75.0%) (40)	3.08 (1.06) (73.1%) (26)	N/A	N/A
Interaction w/VTT instructor	4.23 (0.88) (87.9%) (31)	4.15 (1.08) (90.0%) (40)	3.60 (1.15) (84.6%) (25)	4.33 (0.74) (97.3%) (111)	4.23 (0.73) (95.8%) (47)
Interaction with instructional coordinator	4.72 (0.52) (97.0%) (32)	3.92 (1.38) (80.0%) (40)	4.40 (1.00) (88.5%) (25)	4.39 (0.66) (99.1%) (110)	4.21 (0.91) (89.6%) (47)
Interaction w/military site coordinator	4.59 (0.71) (93.9%) (32)	4.15 (1.25) (82.5%) (40)	4.76 (0.44) (96.2%) (25)	N/A	N/A

Table B3.3
Student Ratings of Course Characteristics
(5 Point Scale, 5 = Highest)
X (SD)
(% Ranking 3,4,5)
(N)

ITEM	71L10	76Y10	95B10	HAZ	TQL
General course organization	3.00 (1.22) (69.7%) (32)	2.95 (1.18) (70.0%) (40)	3.38 (1.06) (80.8%) (26)	3.84 (0.93) (92.8%) (111)	4.06 (0.95) (93.7%) (48)
Quality of lesson presentations	3.44 (1.01) (78.8%) (32)	3.28 (1.13) (72.5%) (40)	3.19 (1.17) (65.4%) (26)	3.95 (0.85) (93.7%) (110)	4.00 (0.83) (97.9%) (48)
Quality of printed materials	3.88 (1.08) (75.8%) (33)	3.55 (1.13) (85.0%) (40)	3.65 (1.26) (80.8%) (26)	4.17 (0.80) (98.2%) (111)	4.19 (0.82) (95.8%) (48)
Time to cover topics	2.69 (1.12) (51.5%) (32)	3.68 (1.02) (85.0%) (40)	3.42 (1.33) (76.9%) (26)	3.24 (1.22) (75.7%) (111)	3.13 (1.21) (66.7%) (48)
Intro to VTT course	4.00 (1.06) (90.9%) (33)	4.00 (1.20) (90.0%) (40)	4.08 (0.95) (88.5%) (25)	3.98 (0.85) (94.6%) (111)	4.15 (0.77) (97.9%) (48)
Intro to TNET equipment	4.06 (0.83) (97.0%) (33)	3.55 (1 18) (90.0%) (40)	4.08 (0.86) (92.3%) (25)	4.01 (0.83) (96.4%) (111)	4.08 (0.87) (95.8%) (48)
Overall course quality	3.59 (0.98) (32)	3.55 (1.18) (40)	3.19 (1.10) (26)	4.04 (0.92) (111)	4.10 (0.81) (48)
Pacing of course (3=about right)	3.48 (1.34) (69.7%) (31)	2.68 (0.91) (60.0%) (34)	2.04 (1.06) (34.6%) (25)	2.94 (0.86) (75.7%) (110)	3.11 (0.87) (75.0%) (47)

Table B3.4

Instructional Coordinator Rankings of Course

(5 Point Scale, 5 = Highest)

$\bar{X}$
(N)

ITEM	71L10	76Y10	95B10
Quality of VTT lesson presentations	4.80 (30)	4.00 (34)	4.17 (39)
Student interaction with teacher	4.87 (30)	4.21 (34)	4.21 (39)
Instructor's use graphics/charts	4.67 (30)	3.98 (34)	4.02 (39)
Wise use of available time	4.70 (30)	3.93 (34)	3.69 (39)
Classroom use of exercises, games, activities	4.79 (30)	4.04 (34)	4.14 (39)

Appendix G

Tables from Objective B5

Table B5.1

Correlations of Student Demographic Variables with Objective and Subjective Measures of Performance

SA = Self assessment of post-course achievement
PT = Posttest
Gain = Gain scores (pretest minus posttest)
(+ indicates significant positive correlation, - indicates significant positive correlation, p < .05)

	[illegible]					[illegible]			[illegible]			[illegible]		[illegible]
	SA	PT	Typing [illegible]	[illegible] PT	Gain	SA	PT	Gain	SA	PT	Gain	PT	Gain	PT
Grade	–	–												
Relevance of current PMOS					+	–		–						
Length of time in current PMOS						–		–						
Relevance of current duty position			+		+	–							+	
Length of time in current duty position												+		
Related civilian occupation	+	+												

Table B5.1
(continued)

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	RT	Grade	[illegible]	RT	Grade	RT	Grade	RT
Education - relevant military training		–		+			+							
Months of college						–								+
ETS Date/Interest								+		–				
Distance Ed. related previous TV course					–						+			+
Previous CAI course										–				
Previous correspond. course							–							
SA of computer skills		+	+	+										
Related TQL courses														+
Related work experience (civ)	–			+		–			+					

Table B5.1
(continued)

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ASVAB composites					
·Combat(CO)	+ –				
·Operators & Food handlers (OF)	+ –		+		
·Mechanical Maintenance (MM)	+				
·Field artillery (FA)	+				
·Surveillance/ Communications (SC)		+			

Table B5.2
Regression of Objective Posttest Scores on Student Background Characteristics

[illegible]	71L10 [illegible]	71L10 Memo	76Y10	95B10	HAZ	TQL
Step 1 MoColl	CompSkl	MilRes	MilRes	ASVAB-ST	PMOS	PMOS
Step 2	--	--	ASVAB-CL	--	--	MilRes
R	.65	.35	.65	.66	.24	.64
R^2	.43	.13	.42	.44	.06	.41
F	12.60	4.46	8.67	7.12	6.19	15.39
df	1,17	1,31	2,26	1,9	1,103	2,44
p<	.003	.05	.002	.03	.02	.0001
Equation						
Var 1	CompSkl	MilRes	MilRes	ASVAB-ST	PMOS	MoColl
Beta	.59	.35	.83	.26	.24	.57
t	3.33	2.11	3.10	2.67	2.49	4.88
p<	.003	.05	.001	.03	.02	.0001
Var 2	--	--	ASVAB-Cl	--	--	MilRes
Beta			.16			.25
t			2.83			2.18
p<			.01			.04

Table B5.3
Regression of Objective Gain Scores on Student Background Characteristics

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Step 1	CompSkl	TVCrs	ASVAB-SC	Reas	HWEnvir	No Data
Step 2	ETS	PMOS	DutPos	TVCrs	CrsInt	
Step 3	--	--	Corres	ReadHrs	--	
Step 4	--	--	ETS	--	--	
R	.73	.58	.82	.72	.29	--
R^2	.53	.34	.67	.52	.08	
F	10.46	6.85	10.83	7.27	4.71	
df	2,16	2,27	4,22	3,20	2,104	
p<	.003	.004	.0001	.002	.01	
Equation						
Var 1	CompSkl	TVCrs	ASVAB-SC	Reas	HWEnvir	--
Beta	.62	-.40	.61	-.43	-.21	
t	3.62	-2.57	4.72	-2.74	-2.25	
p<	.003	.02	.0001	.02	.03	
Var 2	ETS	PMOS	DutPos	TVCrs	CrsInt	--
Beta	-.38	.39	-.54	.43	-.19	
t	-2.24	2.51	-4.07	2.77	-1.99	
p<	.04	.02	.0005	.02	.05	
Var 3	--	--	Corres	ReadHrs	--	--
Beta			-.40	-.35		
t			-3.04	-2.23		
p<			.007	.04		
Var 4	--	--	ETS	--	--	--
Beta			.31			
t			2.45			
p<			.03			

Table B5.4
Regression of Subjective Post Course Performance on Student Background Characteristics

[illegible]	71D10	75Y10	95B10	HAZ	TQL
Step 1	Grade	MoColl	ASVAB-OF	No Data	No Data
Step 2	TVCrs	--	DutPos		
R	.54	.33	.85	--	--
R^2	.29	.11	.71		
F	5.93	4.30	8.79		
df	1,30	1,36	2,7		
p<	.007	.05	.012		
Equation					
Var 1	Grade	MoColl	ASVAB-OF	--	--
Beta	-.44	-.33	.79		
t	-2.80	-2.07	3.89		
p<	.009	.05	.006		
Var 2	TVCrs	--	DutPos	--	--
Beta	.32		.45		
t	2.03		3.85		
p<	.05		.03		

Table B5.5
Regression of Subjective Pre-Post Gain on Student Background Characteristics

[illegible]	71L10	76Y10	95B10	HAZ	TQL
Step 1	ASVAB-OF	DutPos	None	No Data	
Step 2	--	MoPMOS	Signif.		
Step 3	--	PrevExp			
R	.64	.85	--	--	
R^2	.41	.72			
F	12.64	21.80			
df	1,18	3,26			
p<	.003	.0001			
Equation					
Var 1	ASVAB-OF	DutPos	--	--	
Beta	.64	-.57			
t	3.56	-5.08			
p<	.003	.0001			
Var 2	--	MoPMOS	--	--	
Beta		-.42			
t		-4.01			
p<		.0005			
Var 3	--	PrevExp	--	--	
Beta		-.25			
t		-2.23			
p<		.04			

Table B5.6
Rating of Course Materials and Processess

	71L10	76Y10	95B10	HAZ	TQL
Date of birth			+		
Grade			-		
PMOS (time in)			-		
Intent to reenlist			+		
Interest				+	
Dist. Ed./Tech.				+	

Table B5.7
Regression of Composite Rating of Course Materials and Processes on Student Background Characteristics

	71L10	76Y10	95B10	HAZ	TQL
Step 1	None Signif.	None Signif.	MoPMOS --	CrsInt --	None Signif.
R	--	--	.70	.23	--
R^2			.49	.06	
F			7.73	5.89	
df			1,12	1,101	
p<			.02	.02	
Equation					
Var 1	--	--	MoPMOS	CrsInt	--
Beta			-.22	.23	
t			-2.78	2.43	
p<			.02	.02	

Table B5.8
Overall Ratings

	71L10	76Y10	95B10	HAZ	TQL
Date of birth					-
PMOS (time in)	+		+		
Intent to reenlist	+				
Prin. related mil. course	-				
ASVAB MM ST	 	 - -			
Time in college	-			+	
College degree	-				
Dist. Ed./Tech. prior TV course prior correspondence	 +			 + 	

Table B5.9
Regression of Overall Course Ratings on Student Background Characteristics

	71L10	76Y10	95B10	HAZ	TQL
Step 1	MoColl	ASVAB-GM	Credit	MoColl	DOB
Step 2	--	MoPMOS	MoPMOS	--	--
R	.48	.72	.71	.20	.34
R^2	.24	.52	.50	.04	.11
F	5.22	11.22	8.65	4.54	5.48
df	1,17	2,21	2,17	1,105	1,43
p<	.04	.001	.003	.04	.03
Equation					
Var 1	MoColl	ASVAB-GM	Credit	MoColl	DOB
Beta	-.48	-.69	-.54	.20	-.34
t	-2.29	-4.16	-3.13	2.17	-2.34
p<	.04	.001	.006	.03	.03
Var 2	--	MoPMOS	MoPMOS	--	--
Beta		-.62	-.43		
t		-3.74	-2.53		
p<		.002	.03		

Appendix H

Standard TNET Requirements

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Standard TNET Classroom Equipment

Standard TNET equipment provided for each site consisted of:

- An antenna and feedhorn (2.4 meter dish antenna)
- A PC dedicated to communications
- A unit for encoding and decoding the compressed digitized signal
- Audio equipment, including microphones
- A remotely controlled camera
- Two (2) 35" monitors
- A graphics stand with camera
- A desk-top controller unit to handle transmission and reception
- Cabinet for equipment: 74"H, 72"W, 31"D
- A multimedia computer system

Room Size and Configuration

The teletraining room should be a standard classroom approximately 20' by 25'.

The room should be configured so that viewers sit no closer than 6 feet from the screen, with a maximum of 8 times the width of the screen at an angle no greater than 45 degrees.

The classroom must provide a route for the antenna cable for connection to the VTT equipment.

The room must be able to accommodate the equipment in its cabinet: 74"H, 72"W, 31"D, weight of 860 lbs. The doorway must be wide enough to admit the cabinet.

The furniture must include a table or tables for the audiographics system (pad and computer), the graphics stand, and any other equipment used in a particular application.

Furniture should be laid out to accommodate installation of microphones, microphone cables and antenna cable.

Room Conditions

When classes are not in session, the room temperature may range from 50 to 100 degrees Fahrenheit (10 to 40 degrees Centigrade). The humidity may range from 20 to 90 percent.

When classes are in session, the recommended room temperature may range from 65 to 68 degrees Fahrenheit in winter (18.3 to 20 degrees C) and from 75 to 78 degrees Fahrenheit in summer (23.9 to 25.6 degrees C). The relative humidity should be 50 percent or the design temperature equal to the outside air dew point temperature, whichever is less.

The lighting should be sufficient for presentation of normal resident courses (30 foot candles for area lighting, 50 foot candles for work station lighting)

END

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DATE: 7-94

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